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EDITORIAL

CANINE DISTEMPER

THERE was published in the May, 1951, issue of this journal an interesting and important article on the isolation of a neurotropic virus from a dog which suffered from so-called nervous distemper. We draw special attention to this article and to the experimental results recorded in it, for it would appear that the findings may explain some of the complications which may be associated with canine distemper. Veterinary surgeons in practice have been long acquainted with nervous symptoms in dogs which have followed, often some weeks later, an attack of distemper in which the classical symptoms were present: in many instances the symptoms have been quite mild in character or have passed almost without notice. The "nervous form" of distemper has often been dreaded by veterinary surgeons. There is much evidence from practical experience to show that the incidence of nervous complications varies from time to time, but, although few instances may be found at any period, the occasional case occurs. We have now good evidence from this recent work that the virus of distemper can produce symptoms of different types, varying from those associated with the classical disease as recorded by workers in this country to those recognised as occurring in the "nervous form" of the infection. In this experimental work the production of the types of symptoms was dependent upon the route of injection of the virus, and the virus with neurotropic characters needed several passages, parenterally, in order to induce symptoms associated with the "visceral" form of the infection. It seems evident, therefore, that the virus-cell relationship can be altered, and following alteration the different symptoms are produced.

XUM

This article is specially valuable in that it contains much evidence on the antigenic relationship of viruses associated with what may be termed the "distemper complex." Immunologically, the types of virus in this "complex" which have been examined appear to be identical: this information is of much importance, for it establishes that, in all probability, there is one "common" virus which can assume characteristics, almost certainly because of virus-cell relationship, and these characteristics are reflected in the symptoms produced in dogs and ferrets when infected. We believe that the findings recorded in this article go far to explain some of the more recent observations published in this and in other countries.

This work, which, we understand, is being continued, may also prove valuable in the study of other viruses.

INTERNATIONAL VETERINARY COLLABORATION

During last month the annual meeting of the Office International des Epizooties was held in Paris, when representatives from countries which are members of that organisation met for a week and discussed subjects which had been agreed upon at the 1950 meeting. These comprised Q fever, equine infectious anæmia, tularæmia, rinderpest, leptospirosis, bovine infertility of infectious nature, and infectious agalaxie of sheep and goats. In addition, committees set up last year or in previous years presented progress reports: two of importance were those dealing with the control of bovine tuberculosis and the standardisation of veterinary biological products. The papers and reports presented and discussed will, doubtless, be published in due course in the Bulletin of the Office. It was pleasing to note that in addition to delegates from member countries there were also present representatives from other countries and from other organisations which are concerned with the control of diseases of animals. These organisations are: Food and Agriculture Organisation of United Nations (F.A.O.), World Health Organisation (W.H.O.), and Organisation for European Economic Co-operation (O.E.E.C.), each of which has sections concerned in some way with animal disease control.

It is becoming evident that the need for co-operation and collaboration between all these various bodies is necessary. No doubt each of them is undertaking important work and is filling a useful rôle in the activities which it is pursuing. A common meeting ground, such as the annual meeting of the Office International des Epizooties, is valuable and desirable so long as a number of organisations exist. It may be that more consideration should be given to a further linkage between the different organisations so that important problems of disease control can receive joint consideration and joint action. Each is certainly making excellent contributions in different parts of the world and is carrying with it the latest findings of research work. We hope that whatever collaboration is possible will continue and be extended so that the veterinary profession will play its essential part in the welfare of the animal and human population in all countries.

XUM

SPECIAL ARTICLE

HISTORY OF THE VETERINARY PROFESSION 1851-1951—(*Continued*).

B.—The Turn of Events Immediately After the Charter of 1844, and the Consequences felt therefrom a Century Later

By J. T. EDWARDS, D.Sc., M.R.C.V.S.,

C'est le premier pas qui coûte.
—FRENCH PROVERB.

Histories make men wise.
—FRANCIS BACON.

I

THE purpose of the present instalment in our series of articles is to reproduce, in close juxtaposition, two sets of extracts from the annual reports of the Royal College of Veterinary Surgeons published at almost precisely a full century apart. For the moment, we can shut out, with much advantage, the details of what happened during the course of that century. At least, there is no need to strain the attention of the reader or trespass on the space of this journal beyond what one feels bound to say in making clear the point that now—and only now, at this present date—stands out with starry brightness in the "cool light of history."

That point is: the very next year after the grant of the Charter a false step was taken by the veterinary profession in this country. Not until the socio-political "climate" changed back again, as it did only after the country was fully stirred at last out of its complacency by this last war of 1939-1945, was the profession, too, moved to a sense of its full and rightful usefulness to the public. And then the profession was *forced* to move, and in a direction that was dictated to it, for weal or woe, by the State.

This much more needs to be said by way of introduction. On the occasion of the centenary of the grant of the Charter of 1844 the duty was discharged on behalf of the National Veterinary Medical Association of Great Britain and Ireland of bringing into focus, for the first time, that stirring episode in our history which established us as a profession (see *Veterinary Record*, 1945, December 22, Vol 57, No. 51). More than that, on that occasion, an attempt was made, with help from diverse colleagues, to place on record a faithful portrayal of the scene after the profession had enjoyed a century of recognition as such. It was hoped that by so doing the historian of the future will not be gravely troubled to discover how life is lived by the profession at a given moment in our current history. Thus, the hard task of the present-day historian to trace how in real truth the profession was disporting and demeaning itself within its own setting

in bygone epochs will be lightened in good measure for his successor. It would be vain to think that the task was done perfectly—the episode remains still a rich field for historical research—but, such as it was, we would crave the patience of the reader, to save repeating much that otherwise we would be troubled to say again, to cast his eye upon the shortened story of the cardinal episode that was the Charter, then offered for his enlightenment.

Now, between 1944 and 1951, events have moved on, we were about to say, at an alarming rate. We feel we would not be guilty of insobriety in the use of language, in any case, if we were to say that during this short interval the mind has had to make so many readjustments that, already, memory of what precisely happened in 1944 grows dim. And so it had been between 1844 and 1851—and, perhaps, to a like degree, at hardly any correspondingly short interval in modern history. The qualification " modern " is used in the sense in which the historian uses it, to embrace what is, after all, but a short spell in the recent story of mankind.

To have failed to readjust itself quickly to the fast-moving scene a full century ago was destined to cost the profession dearly. Less than a generation later (see T. W. Mayer's address, " The Charter, its History and Mistakes," delivered at the first all-British National Veterinary Congress, in 1867, *The Veterinarian, 45,* 478-505), the wail was heard loud and long among the rank and file of the profession in ordinary practice: " What good has the Charter done us?"

There *need* not have been any wailing if, in 1845, those who led the profession had not allowed those qualities to flag which so often flag, after success, no less than in adversity, namely, those of wisdom and of courage.

II

The impression had been gradually forming in the writer's mind that the drastic transformation in the British veterinary profession wrought by the Veterinary Surgeons' Act, 1948, of which no one can as yet forecast the consequences, was, to a very large extent, inevitable. Furthermore, the processes leading to that transformation, it was felt, could not be assigned to the credit, or discredit, of certain people most actively interested in shaping events during the few years immediately preceding the passing of the Act, so much as to turns in affairs several decades earlier.

Much misconception in the minds of the Government and its advisers, as well as of the veterinary profession, could certainly have been dissipated if the whole period between the Charter of 1844 and the critical phases of shaping that Act had been subjected to searching historical enquiry. Obviously, the only man in the profession equipped for that task was the late Sir Frederick Smith, whose death from heart trouble in 1929, when (as his papers reveal) his mental faculties were unimpaired, was a major tragedy to the profession. Had he survived a few more years he would have almost certainly illuminated the situation far and away better than did the personnel of the several departmental committees appointed from about the time of his

XUM

death to guide authority upon ways and means to strengthen the profession as an instrument of public service. This is evident from the texture of his address delivered before the 30th General Meeting of the National Veterinary Association in 1912, which constitutes almost the only deeply critical examination extant of the state and trends of contemporary veterinary education in this country. It is a pity that at that time, and even earlier, the solicitude expressed in certain quarters to recruit him actually to a leading position on the staffs of our veterinary colleges was frustrated.

From a perusal of Smith's address, the writer became confirmed in the impression that the modern phase culminating in the 1948 Act could be dated back to 1890, when Professor Walley, prematurely, moved in Council, R.C.V.S., that the curriculum should be extended from three to four years, elementary education becoming free and compulsory throughout the country only in 1891. Thereafter, under the dominating influence of McFadyean and Bradley, whose own outlook had been severely deflected to academic interests and was deeply conditioned by training in human medicine, what had become known as the one-portal system, destined to produce a corps of professional veterinarians for current practice, was doomed to destruction.

Writing in 1936 (*Histoire de la Médecine Vétérinaire*, p. 414), Leclainche said: ". . . Until now the R.C.V.S. has discharged its task with perfect discernment, and the strictness it displays is amply justified by its eminently praiseworthy desire to maintain a high professional standing. These requirements, as well as the extension of the curriculum to four, and then to five, years may have been regarded by some observers as a means of restraining rivalry among practitioners; however, the one-portal system of admission into the body corporate does not seem to be menaced at all, in spite of attack from the Universities. . . ."

A generous tribute from the world's greatest living authority on this subject, and, be it added, thoroughly well deserved! But whatever high rank Leclainche may be deemed to have attained among historians, his ranking as prophet, in view of the present shape of things, cannot be placed quite so high.

Smith states the case differently. And from the diverse accounts he gives in describing the lifework of personalities who played an active part in the unfolding of the drama, we may quote with advantage short passages from the story of one of them, J. Beart Simonds (1810-1904):—

". . . Simonds's political activities in the Council of the Royal College of Veterinary Surgeons after the accession of Spooner (1806-1871) to the Principalship (1853) were continued, if not aggravated. The Charter of the Royal College was still the bone of contention: it had reduced the Royal Veterinary College to impotence as a political body, and confined it to its true and only function of a teaching school, not the directing head of the profession. . . . As his professional position grew stronger his boldness increased, until in 1857 we actually find him threatening the Royal College of Veterinary Surgeons that the Royal Veterinary College was about to do as Dick had done, and examine its own students! The fact was that Spooner and Simonds intended to coerce the Royal

College into agreement with them. . . ." Simonds succeeded Spooner in the Principalship on the latter's death in 1871, and Smith adds: ". . . He had taken over an institution in a state of decay. *Thirty-two years of civil war had well-nigh completed the destructive work of Coleman* (1765-1839). . . ." (our italics).

The above very short passage from Smith's writings very accurately reflects a situation which, if it were to be displayed faithfully as an exercise in historical research, considering the rich documentation available, would need a large volume. No attempt at summarization is justified until that is done. All that can be done in an essay is to place before the reader random samples of the evidence which goes to show, as it must ultimately show, that the Act of 1948 was not, as we had recently, erroneously, surmised, the outcome of a turn dating back to 1890. It was the close of a long civil war—what might aptly be termed a Hundred Years' War—dating back to 1845, the very next year after the grant of the 1844 Charter, our "Charter of Liberties." It was a long and desultory war, from the educational, no less than from the professional aspect. As we have already said in the above first section, it was a war, too, that could easily have been, and nearly was, averted. The bitterness of that war in its earlier phases must be almost without parallel in the annals of professional institutions. The pity of it!

On the educational side, however, the Council, R.C.V.S., remained oblivious of all the powers that were placed in its hands in virtue of the 1844 Charter itself until Sir Frederick Fitzwygram assumed the presidency in 1875, vigorously backed as he then was by a rising star in the veterinary firmament, George Fleming. (This development has been already touched upon by the writer, in paying due tribute to Fleming as founder of this journal in the special issue of August, 1949, on the occasion of the 14th International Veterinary Congress, held in London.)

So often it has been complained by those in high places in our profession that the Government of this land has done little or nothing to help the profession to its feet. So seldom has it been confessed that the profession itself—save for some rare spirits, like the Mayers (who are soon unremembered, and have no shrine), has not, after all, done at all times what it ought to have done to get on to its own feet.

What humiliation to their successors those early contestants could have saved had they, instead, concentrated on consolidating, as they could easily have done, the most enviable position they had gained in 1844! If they had achieved that consolidation by the time of the Great Exhibition of 1851, and not sunk into the gloom evident in W. Percivall's one editorial—the only writing (as we said in our first instalment in this series) on that national event by a British subject to appear in the veterinary Press—this present Festival of Britain year might very well have been celebrated, too, as a Festival of British Veterinarians year.

XUM

III

The most essential first series of documents from which the reader will not fail, we think, to draw conclusions in conformity with our belief are now reproduced:—

SECOND REPORT OF THE COUNCIL OF THE ROYAL COLLEGE OF VETERINARY SURGEONS TO THE MEMBERS OF THE PROFESSION

Whitehall, August 18, 1845.

Sir,

I am directed by Secretary Sir James Graham to acquaint you, that he has received from various quarters, and from parties who feel a deep interest in the advancement of veterinary science, application for the grant of a Charter of Incorporation differing, in some respects, from that which was recently granted by Her Majesty to you and certain other members of the veterinary profession.

Sir James Graham is disposed to attach weight to the representations which have been made to him on this subject; but it appears to him that modifications might be introduced into the existing Charter which would attain the objects sought by the parties making these representations, and which would, indeed, as Sir James believes, render the Charter more satisfactory to the profession at large. Before he takes any steps, therefore, in this matter, he will be glad to learn from you what may be the views which are entertained with regard to it by those to whom the existing Charter has been granted.

Sir James Graham does not think it necessary at the present moment to enter into any detail of the specific alterations which have been suggested to him; but he will be prepared on a future occasion to communicate them to the Royal College of Veterinary Surgeons, in the event of their concurring with him in the opinion that, under the circumstances which he has stated, it is desirable that the Charter possessed by them should undergo revision.

I am, Sir,
Your obedient servant,
H. MANNERS SUTTON.

Mr. Thomas Turner,
Veterinary Surgeon, 311, Regent Street.

To the Right Hon. Sir James Graham, Bart., Her Majesty's Principal Secretary of States for the Home Department.

Sir James,

I have the honour to acquaint you that a meeting of the Council of the Royal College of Veterinary Surgeons was held at the Imperial Hotel, Covent Garden, on Thursday, the 11th inst., at which it was unanimously agreed as follows:—

"That the views entertained by the Council are, that the present Charter is all the general body of the profession either wish or require, and, therefore, they are most desirous to retain it in all its present integrity."

XUM

These views are founded on the facts, that not a single complaint has been made against it by any one member of the profession unconnected with the Colleges of London and Edinburgh, and that the objections raised by the parties connected with these establishments have not been grounded on the improvement and advancement of the profession at large.

They would also adduce the important proof of the approbation of the body of the profession, given at the Annual General Meeting, in the re-election of five out of six of the retiring members of the Council.

Under these circumstances the Council would take the liberty to observe, that they cannot conceive any points of view in which the Charter with which they have been honoured can require revision.

But at the same time, wishing to treat with the greatest respect the high source from whence these intimations have emanated, they will be prepared to give to any suggestions, when made known, that grave and mature consideration which their importance will doubtless demand.

An anxious duty of the Council has been to prepare a code of bye-laws tending to the improved education and future well-being of the body politic and corporate: they have done this to the best of their ability; but they are well aware that alterations and amendments may still be necessary to render them perfect, and any modifications and amendments that may be suggested, having these objects in view, will receive their undivided attention.

I have the honour to be,
Sir James,
Your most obedient servant,
THOMAS TURNER.

311, Regent Street,
September 12, 1845.

Whitehall, November 11, 1845.

Sir,

I am directed by Secretary Sir James Graham to acknowledge the receipt of your letter of September 12, in which you state that the Council of the Royal College of Veterinary Surgeons is prepared to receive and maturely consider any suggestions which may be laid before them by the Secretary of State for the alteration of their Charter.

In proposing a revision of the Charter, Sir James Graham is influenced by the same desire for the improvement of the veterinary profession by which he was guided in advising Her Majesty to grant it.

Notwithstanding the arguments adduced by you in proof of the general acquiescence of the profession in the provisions of the Charter as now constituted, Sir James Graham has received intimations that this satisfaction is not shared by several important bodies deeply interested in the advancement of your profession. To some of these institutions are mainly due those improvements in the knowledge and skill of veterinary surgeons which entitled you to ask for recognition by the Crown as professing a liberal science; and from that and other con-

XUM

siderations they possess claims which it is impossible to overlook. It is anxiously desired by Sir James Graham, that means should be found of interesting them in the progress of your College, rather than that they should continue to urge hostile pretensions, which cannot but be detrimental to your prosperity, and might possibly lead to the establishment of a rival institution, which would weaken your influence and utility as much as their union with your body would impart to it strength and dignity.

The main change which Sir James Graham is desirous of recommending in your Charter would be the reconstitution of your Council, so that it should consist partly of practising members of the profession, partly of nominees of the principal educating colleges and agricultural societies of the United Kingdom.

With a body so constituted some great officers of State—such as the Master of the Horse, the Master of the Buckhounds, and some of the principal medical and surgical officers of Her Majesty's forces—might properly be associated: the propriety of such an addition is obvious, on considering how important veterinary science is to the efficiency of Her Majesty's cavalry.

It is the opinion of Sir James Graham, that by this alteration the opposition of the influential bodies to which he has already alluded might be obviated, and, at the same time, that additional dignity would be reflected on the whole profession.

A body constituted on such a basis as I have sketched would have the character of a national institution, and its diplomas would be everywhere received with more consideration than when proceeding from a body exclusively composed of practising veterinary surgeons, as now established, however respectable. I shall be ready, on the part of Sir James Graham, to receive a deputation from your Council for the purpose of considering the steps proper to be taken, after you have fully weighed the proposition in all its bearings, and the consequences of its adoption or rejection by your body.

I am, Sir,
Your obedient servant,
H. MANNERS SUTTON.

T. Turner, Esq.,
Regent Street.

"In consequence of the intimation thus conveyed, that Mr. Manners Sutton would be prepared to receive a deputation from your Council, your President, Messrs. Percivall, Goodwin, Field, and the Secretary, were deputed to wait on that gentleman at any time that he might appoint, and, accordingly, the interview took place at the Home Office on Monday, November 24, 1845: its result is contained in the following report to your Council:—

"'Your President has to report, that an interview has taken place with Mr. Manners Sutton, who, at the commencement, remarked that he had requested it upon the understanding that the Council had agreed to certain alterations being made in the Charter. The President, however, begged to remind Mr.

Manners Sutton that no such acquiescence had been given. Upon which that gentleman declined entering into any particulars of the views of Sir James Graham, and the interview closed.

THOS. TURNER, *President,* on behalf of the Deputation.'

" You will at once perceive that, should the suggestions of Sir J. Graham, or any analogous thereto, be entertained, the principles of your Charter would be undermined, and its integrity destroyed; for, instead of a Council elected by yourselves, chosen from your own body, and therefore intimately acquainted with the wants and interests of the profession, the whole affair would be under the control of the Government; your elective franchise would be lost, and professional talent and character would be undervalued. . . ."

IV

The above reports of the Council, R.C.V.S., came up for consideration before a fateful meeting—the third annual meeting of members of the Royal College of Veterinary Surgeons, held in accordance with their Charter, at the Freemasons' Tavern, Great Queen Street, Lincoln's Inn Fields, London, on June 4, 1846 (see *The Veterinarian,* 1846, *19,* 324), under the presidency of Mr. Thomas Turner, of Regent Street, about sixty members being then present.

The President opened the business by referring to the boon which had been granted them by their Sovereign in obtaining the Charter of Incorporation. The advantages given by the Charter were " of no ordinary kind." " It was founded on the genuine principles of representation." Though the Charter, of itself, " could do nothing for them . . . the obtaining of it would," he had no doubt, " be the stepping-stone to the getting of other and more solid immunities. . . ."

Afterwards, F. C. Cherry, then Principal Veterinary Surgeon to the Army, rose to move a resolution that the report (reproduced as above in the preceding section) be referred back to the Council for its further consideration. Most unfortunately, although his criticisms had been well prepared beforehand, they were couched in language unlikely to win over opponents, but rather to incense them. Much was said that was irrelevant to the main issue, the relevant argument being confined to a few words towards the end of his speech : ". . . Now what appeared to him (Mr. Cherry) to be the real facts of the case were, that the Secretary of State did not want to annul their Charter, but he merely asked for a revision, and stated that, if the Council would consent to that, he would then enter into a specification of the revisions he proposed; on which the Council had got up in arms directly, and had come to the extraordinary resolution found in the report, which declared that that was all the profession required, and had at once shut the door in the face of Sir James Graham, telling him they would have nothing to do with him, as they were quite satisfied with what they had got. He had now the extraordinary letter of the President, which was really like giving the Secretary of State a slap in the face, and sending him off with a flea in his ear. . . . It was clear to him, from the statements of the Council made in the report, that the Minister was ready to listen to any representations of the Council; but, at the same time, he had no doubt the Secretary of State had made up his mind

to demand some concession. The very fact of the Under-Secretary receiving a deputation showed that he considered there was something to be conceded; and when the deputation went, the President explained they would make no concessions, and they were immediately bowed out. . . ."

Professor Dick then rose to second F. C. Cherry's resolution, and, in a carefully prepared speech, made a number of statements which were also provocative, and in part erroneous, such as, for example, that the Council had no power under the Charter to establish a curriculum. But, he contended, with perfect truth, " that the Charter gave no power to prevent other persons assuming the title of ' Veterinary Surgeon,' " continuing at once with the inference " and therefore was good for nothing," that provoked hostility among those members exulting in their newly-won success.

An amendment was then put that the report of the Council as read be adopted, and, after acrimonious debate, the amendment was carried by 30 votes to 14.

And so was sealed the fate of the profession for a century.

It might be argued that had the Council been elected by the votes of the whole profession, as it was elected later, instead of at an annual general meeting of the members, as it was at that early stage, the result would have been different. This is doubtful. Hardly ever afterwards did more than one-fifth to one-fourth of the profession come to trouble themselves to exercise their right to vote. And of those of the rank and file of the profession who voted there was no very striking indication that the people for whom they cast their votes were selected invariably for their merits as supreme exponents in the actual practice of the veterinary art, and could therefore be trusted to guide authority and plan for the future from knowledge and experience. A sadder reflection still is that after a stubborn fight had been put up recently to retain as far as possible the representational structure of the Council, no candidates were put up by the profession at large to fill vacant seats at this last election of members of the Council.

V

It is evident, at this date, that the wrongs were by no means as much on one side as Smith would have us believe. We need to study closely the text of Sir James Graham's extremely courteous (as it seems to us) letter to the President of the Royal College of Veterinary Surgeons, bearing date November 11, 1845, to rally us to that view. We need, too, to bear in mind three matters essentially relating to the situation.

Firstly, the signatures of the professors at the then two existing schools had been obtained to the petition for the Charter in the fervour of the movement which, surprisingly to them, culminated in the actual grant of the Charter, without their taking fully into their confidence those bodies which had, until then, sponsored them in their own avocations, namely, the Governors of the Royal Veterinary College, London, and the Highland and Agricultural Society

XUM

of Scotland. There was no question at that date of the Universities participating in any way to foster veterinary education. On the contrary, they were openly hostile towards it. It was not until the present century had got under way that they began to evince any interest in veterinary education. To be precise, it was not until 1904, when the Universities of London and Liverpool sought to obtain powers to grant degrees which would be recognised as registrable qualifications —and then failed. In common equity, therefore, it seems now, the above sponsoring authorities ought to have been invited, graciously and immediately, to select their own nominees for seats on the Council, while reserving to the practitioners themselves, as clearly suggested in Sir James Graham's letter, the privilege of electing their own representatives in adequate preponderance to seats on the Council. Instead, it soon came about, with the passage of time, that the Council was dominated, by turn, with School influence, and then by Army influence, while the practitioner influence, for long periods, was pathetically ineffectual.

Secondly, there was no question, at that date, of the State interesting itself comprehensively and directly in matters of agriculture. That did not come about until the re-creation of the Board of Agriculture in 1889. The same could be said about matters relating to Public Health; and, of course, the animal charitable organisations, of which the powerful forerunner, already in full activity, was the R.S.P.C.A. From its very inception, in 1838, the Royal Agricultural Society of England had actively interested itself in veterinary progress, both by its goodwill and actual support out of its meagre financial resources. Soon, however, lack of reciprocity from the profession caused it to withhold its annual grant.

Only at this date, and not only in the veterinary profession, but in all spheres of human endeavour, is the paramount essential of cultivating good "Public Relations" becoming recognised. A man is known, it has often been said, by the friends he makes—the kind of friends he invites to his own home, if, indeed, he invites any. None were invited to the "home" of the profession when it had got itself a home. So how was the world to know what manner of people we were, without good and powerful friends to help us make ourselves felt as a power to reckon with within that world?

Thirdly, instead of consolidating the position gained, in the manner suggested by Sir James Graham, so to sally forth quickly from a strong position to gain the next objective, which was to confirm the provisions of the Charter by Act of Parliament, so as to give them the full force of law, the Council proceeded to dissipate its time and energies reporting adversely on the work of the Schools and in drafting a number of harsh bye-laws (see *The Veterinarian,* 1845, *18,* 293). One of these, if carried into effect, would have reduced the Schools to impotence, and in endeavouring honestly to observe it in the case of the Scottish School it nearly did so. It reads:—

"SECTION II: ADMISSION OF MEMBERS.

"1. No person entering to the Veterinary College of London or Edinburgh, or such other Veterinary College as may be sanctioned by the Charter, on or after January 1, 1845, shall be admitted a Member, or be eligible for

examination by the Board of the Royal College of Veterinary Surgeons, until he has attained the age of twenty-one years.

"2. *No person shall be admitted as a Member of the Royal College of Veterinary Surgeons after 1848, who has not served an apprenticeship of three years to some Member of the College in regular practice during the whole of that period.*" (Our italics.)

We have it on the testimony of William Robinson, as given at the 1867 National Congress already referred to, that so harsh had become the due observance of that particular bye-law that, by 1848, hardly any students came forward to enter Dick's School, which was threatened with the closing of its doors. To avert that calamity, he was therefore obliged to dissociate himself, completely at last, from the R.C.V.S., and revert to the former system of granting qualifying diplomas after examinations held under the auspices of the Highland and Agricultural Society for Scotland.

VI

Let us pause again for one brief moment to examine the nature of the movement within our profession, which began in 1840 and had spent itself by 1845.

That movement was a "revolution." It was as much a "revolution" as the Protestant Reformation, the Industrial Revolution which began about 1760 and is still going on, the French Revolution of 1789-1794, and the Russian Revolution of 1917, which, above all else, is dominating thought and action in the world at the present moment, and, whatever may be alleged about it, is certainly hindering any tendency of relapse into complacency. It was not an "evolution," whatever contrasted meaning that term may still retain, because in the biological world we now better understand that changes do not often, or usually, occur by evenly-graded processes within species, but by "mutations." The movement conformed in all its essentials with the now well-recognised "anatomy" of revolution. [For an excellent analysis of the phenomenon the reader is directed to the concise, up-to-date summary of "The Psychology of Revolution" given in Kimball Young's (1951) "Handbook of Social Psychology."] First, the movement gets started by a particular class of individuals, of the "introverted" type, as a current of intellectual criticism and suggestion. These individuals have it in their gift to give literary or other expression to a deep-rooted, but unexpressed, wish among the masses to overthrow the existing order. When the time is ripe, the movement gets taken up by another class of individuals, "the men of action," of more ruthless, or "extroverted," type, who are well prepared to take physical risks to carry the movement to fruition.

We can now discern in the Charter movement that it was the conspicuous gifts, as a journalist, of William Youatt ("a gentle, amiable man . . . whose name is written in letters of gold upon the tablets of his profession") that provided the intellectual preliminary to the movement. From 1828 onwards he gave vent without respite to the deep dissatisfaction with the existing order

XUM

felt by diploma-holders from the Schools. He died in 1847. It seems not unlikely that his own end came as the result of his readiness to immolate himself in the cause of the profession. (See Smith's [1930] *Hist. Vet. Lit., 3,* 153.)

The movement was taken up then by two men, the Mayers, father and son, who were practitioners, at Newcastle under Lyme, less " introverted " than Youatt was, and were zealots in the cause of their profession. It was they who marshalled the profession into action to the stage of securing the Charter. They formed a link, as it were, between Youatt and what ought to have been forthcoming in the profession as an " elect " consisting of both intrepid, and prudent, " men of action," who, in their turn, with the ground so well prepared for them, ought to have secured speedily Statutory confirmation of the provisions of the Charter and worked with all their might to suppress for all time the baneful rivalry of unqualified practice.

Thomas Mayer, the father, died in 1848. While the opportunity is presented to us now, it is not unseemly to pay homage to his memory by reproducing the following short passages from William Percivall's obituary editorial tribute in *The Veterinarian* (1848, *21,* 653):—

" Helas! Another master-spirit of the veterinary profession has departed from amongst us. . . . Thomas Mayer is no more.

" Let not this expression, however, be misunderstood. . . . His memory—the intellectual being—still remains with, and is endeared to, us by ties that never will be broken. . . .

" It is to Thomas Mayer we are indebted for the Charter of the Royal College of Veterinary Surgeons. Sterner reformers had, indeed, appeared before him, demanding improvements and alterations in the Veterinary College. That College had itself applied for a Charter to increase its influence and confirm its power. But, for the enlarged idea of a Charter based on the necessities of the profession, and constructed so as to enlarge its utility, we are indebted to him—alone, we were going to add; but let us not, in our respect for the dead, forget the first claims of the living. Thomas Walton Mayer, the worthy son of his father, went hand in hand, not only as parent and son, but as friend and friend, in carrying out the great and glorious work. Let this, however, pass—*he* will not regret should the elder branch have every iota of honour due to both. . . ."

Due tribute to the son has already been published in the Charter Centenary issue already referred to. His discernment and high-mindedness can be clearly seen in the open letter he addressed to the President of the Royal College of Veterinary Surgeons, on March 6, 1845, from which, in further tribute, we need only reproduce a few sentences (see *The Veterinarian,* 1845, *13,* 204):—

" . . . It is the duty of the legislature to render efficient protection to those who, at great sacrifice of time and money, have devoted themselves to the study and practice of veterinary medicine. This may be done by making it a misdemeanour for anyone to practise as a veterinary surgeon without proper authority. . . .

XUM

" The time has come when the members of our College from one end of the kingdom to the other should speak out. Meetings should be held—their wants, their wishes, communicated to the Council. . . ."

From the evidence, it appears that this young man exhausted and impoverished himself in the cause of the profession—so much so, that, rather late in life, he was obliged to embark on an Army career, and joined the Army as a veterinary surgeon at the outbreak of the Crimean War in 1854.

It was at the next stage, namely, that in which the revolutionary movement falls due to be taken up by " the men of action," the " sterner " type, that there was weakness. They were, almost without exception, loath to risk seeing their bulging pockets emptied, let alone, as in the great revolutions, gaily face the prospect of having their precious heads chopped off.

To those in thriving practices (virtually, in large part, businesses) in the big towns, and, in particular, London, the Charter had conferred inestimable benefits, because those who ran those practices were now able to claim the standing, and greatly increased fees, of professional witnesses in law cases. But the rank and file of the profession throughout the country generally was soon destined to be disillusioned and disappointed.

VII

The consequences, upon their descendants, can now be fittingly testified by reproducing the second set of extracts, a century later, from the Annual Reports of the Royal College of Veterinary Surgeons:—

Report of the Council of the Royal College of Veterinary Surgeons for the Year 1946.

". . . The Minister of Agriculture has, for many months past, been pressing the Council of the R.C.V.S. to agree to his announcing in Parliament the preparation of enabling legislation to give effect to certain recommendations made in the Second Report on Veterinary Education by the Loveday Committee, and in the Report of the Chancellor Committee on unqualified veterinary practice. . . .

" The first report of (the Loveday) Committee, published in 1938, had been discussed at several meetings of the Council, and by January, 1940, the Council had prepared a statement for submission to the Ministry of Agriculture expressing the Council's views on the Committee's recommendations. But before that communication could be sent an intimation was received from the Ministry that on account of the outbreak of war it would not be possible for the time being to implement any of the recommendations. . . .

" Later, the Minister recalled the Committee and requested them to give further consideration to the matter of veterinary education, and the Second Report of the Loveday Committee was published in April, 1944.

" The Minister of Agriculture in due course invited the Council to send representatives to a conference with representatives of the six Universities mentioned in the Report, and with representatives of the Ministry. . . ."

Then follows a summary of the reports of two such conferences, after which the Council addressed a letter on May 1, 1945, to the Minister of Agriculture, affirming its readiness to co-operate with the Universities in the training and examination of veterinary students. The Council's suggested mode of co-operation was subject to stipulations regarding inspection of facilities at the schools, the course of study and examination, and prescribed exemptions from the successive examinations leading to the final examination for the R.C.V.S. membership diploma, the passing of which had constituted the sole qualification for registration in the Register of Veterinary Surgeons, the conduct of which in the meantime the Council insisted upon retaining. "None of the Universities would," however, "agree to undertake veterinary teaching at all unless they were assured beforehand that any degrees which they would eventually confer would be accepted by this body (i.e., Council, R.C.V.S.) as entitling the holder to registration in the Register of Veterinary Surgeons." *No objection was now raised against the reconstitution of the Council itself by the allocation of seats upon it to nominees of the Government and the Universities.*

The Annual Report continues:—

"Following upon this, the then Minister, Mr. R. S. Hudson, requested the President of the College to meet him, with a few other members of the Council. *At the meeting the Minister refused to accept the [above] letter, and requested the members to go back to the Council and to urge upon the Council the necessity of their agreeing to the following propositions.*" (Our italics.)

These propositions are not repeated, neither are the two further published letters from the Council to the Ministry, respectively dated July 31, 1945, and January 17, 1946, the latter after change of Government, when the new Minister of Agriculture, Mr. Tom Williams, requested the Council to send a deputation of members to meet him to discuss the position. The Council's 1946 Annual Report adds: "*The proceedings of this meeting are still the subject of discussion with the Minister and the Universities, and will be published in due course.*"

The only further published reference to the trend of negotiations, as contained in the Council's 1947 Annual Report, culminating in the Veterinary Surgeons' Act, 1948, is as follows:—

"In connection with the proposed new Veterinary Legislation, eight special meetings of Council have been held.

"In addition, many meetings have been held between the Ministry of Agriculture and Fisheries and the special Drafting Sub-Committee of the Royal College, in which the details of many matters affecting the veterinary profession have been discussed at length. There have also been held several meetings of the Consultative Committee on Veterinary Education, composed of representatives of the Universities which may be affected by proposed legislation, the Affiliated Veterinary Schools, the R.C.V.S., and the Ministry of Agriculture and Fisheries.

"*As these consultations between the various parties which may be affected by veterinary legislation are deemed to be confidential, it has not been possible*

to issue a report to the veterinary profession on how matters stand at present." (Our italics.)

"*Amongst matters which have been discussed are the question of Registrable Degrees, Unqualified Practitioners, Discipline, Annual Fees, Jury Service, and many other points of paramount importance to the profession.* (Our italics.)

"Two very lengthy memoranda have been prepared and submitted to the Minister, and a delegation of the Royal College has had a long interview with him."

That was all the enlightenment which was vouchsafed the profession in regard to so much that concerned its welfare and destinies.

VIII

What need we say by way of epilogue to this present essay? Several passages from Holy Writ come temptingly to mind: "Vengeance is mine . . ." "The mills of God . . ." "Nemesis," and so on.

But, having discharged our duty by throwing light on the above facet of our troubled story, we can, we believe, rest content with the injunction, ". . . silence is golden," and leave it to the reader to draw what moral he pleases from the intellectual fare placed before him, regardless of whether at this date it provokes his enjoyment or his disgust.

Perhaps, at most, what we are constrained to say at this stage amounts to simply this: In modern experimental research it has become recognised that in discussing the significance of any item of enquiry, not only is it assumed that the author has had his hands employed in the work discussed, but that he is also thoroughly acquainted with the history of all previous endeavour within the field of the enquiry. Lack of such acquaintance is inexcusable. Yet, with that strange perversity that has hitherto characterised most human institutions, and often to their sad cost,* those who have guided authority in the shaping of the destinies of the veterinary profession have not manifested, on the whole, the slightest desire to make themselves acquainted with its history; but seem, on the contrary, to have been chosen in measure as they have not soiled their hands in the practice of the art and are ignorant of its history; and remain, withal, loudest in the utterance of what are prejudices or mere opinions. If the profession had harkened to the behests of a strong Government and the warnings of able men like F. C. Cherry and William Dick, a century ago, it is abundantly clear, as a reading of our history now testifies, that in the meantime it would have saved itself a thousand worries, and have been spared, too, we think, the humiliation, in the end, that lay in store for it.

* See, for example, Rowse, A. L. (1946), *The Use of History* (Hodder and Stoughton), p. 27: ". . . If we are to play our part with success in the more difficult and complex circumstances of the modern world we have a promising rôle before us, if we are clever enough to perform it. We cannot afford the conduct of our affairs to fall into the hands of the second-rate men who ran the country between the two wars (no wonder we landed ourselves in a second), to choose a Bonar Law, a Baldwin, a Chamberlain, and turn our backs upon a Lloyd George and a Churchill. We need Pitts and Cecils, Cannings and Disraelis, and if we can produce them, use them. In history is our inspiration. . . ."

(*To be continued*)

STUDIES ON THE ABNORMAL SPERMATOZOA OF BULL SEMEN—II.

By D. H. L. ROLLINSON, B.Sc., M.R.C.V.S.,
Veterinary Investigation Centre, Reading.

(b) Incidence of Types of Abnormalities in Semen

(I) Incidence of Cells other than Spermatozoa in Semen and their relationship to Abnormal Sperm.

The cell content of semen other than spermatozoa has been studied in the fresh state and on flood smears according to the method of Haq (1948). The numbers of ejaculates examined were as follows:—

	Ejaculate I	*Ejaculate II*	*Ejaculate III*
Normal ...	11 ...	13 ...	4
Abnormal ...	28 ...	26 ...	13

This method affords an enumeration of the cells per cu. mm. from the fresh examination, and also allows them to be scored on flood smears. Since the detailed sperm counts were performed on stained smears the scores of cells per flood smear have been used for comparison.

(a) *Squamous epithelial cells.*—Anucleated cells were invariably more numerous than nucleated cells, the ratio of nucleated to anucleated cells being as follows:—

	Ejaculate I	*Ejaculate II*	*Ejaculate III*
Normal ...	1 : 4.9 ...	1 : 4.0 ...	1 : 1.2
Abnormal ...	1 : 5.5 ...	1 : 3.9 ...	1 : 1.7

Nucleated cells.—These occurred in 66 to 81 per cent of ejaculates from normal bulls and 61 to 71 per cent of ejaculates from abnormal bulls, at an average occurrence per flood smear of 3.61 and 3.85 respectively.

Anucleated cells.—These occurred in 96 to 100 per cent of all ejaculates examined, at an average occurrence of 9.10 from normal bulls and 15.99 for abnormal bulls.

(b) *Boat-shaped spermatogenic cells* (Fig. 27).—These were found in 100 per cent of normal ejaculates and in 38 to 61 per cent of abnormal ejaculates, with average occurrences of 8.3 and 12.6 per flood smear respectively. In both normal and abnormal ejaculates the average occurrence fell steadily between the first and third ejaculate.

These cells were never found in flood smears from cases of testicular hypoplasia or in atrophy of the testicle with fibrosis.

(c) *Spermatids.*—These were found in 33 to 54 per cent of ejaculates of normal bulls and 53 to 61 per cent of ejaculates of abnormal bulls. The average occurrence per flood smear was 1.7 and 5.7 respectively.

Anucleated.—These occurred in 0 to 54 per cent of ejaculates from normal bulls and in 23 to 46 per cent of abnormal bulls, the average occurrence being 1.6 and 3.0 respectively.

Multi-nucleated.—These occurred in 7.7 to 33 per cent of ejaculates from normal bulls, and in 19 to 31 per cent of ejaculates from abnormal bulls; the average occurrence per flood smear was 1.0 and 3.0 respectively.

(c) *Spermatocytes.*

Secondary.—These were not found in the semen of normal bulls, but were observed in 3.5 to 7.5 per cent of ejaculates from abnormal bulls at an average of 1 per flood smear.

Primary.—These were not found in the semen of normal bulls, but in abnormal bulls they were seen in from 4 to 7 per cent of ejaculates at an average occurrence of 2 per flood smear.

(e) *Medusa bodies* (Fig. 25).—Structures conforming to the descriptions of Blom (1945) and Haq (1948) were encountered in the semen of both fertile and infertile bulls. They were found in 21.1 per cent of ejaculates from normal bulls and in 16.2 per cent of ejaculates from abnormal bulls. In one case showing testicular atrophy and fibrosis (ABR 34), 51 medusæ were counted on one flood smear. In other bulls the usual number found was 1 per flood smear.

(II) Relationship of Cells to Abnormalities.

In considering the possible relationship between these two components of semen, bulls showing prominent types of abnormalities were selected, and the cell counts compared with those of normal bulls. Two groups of five bulls (12 ejaculates each) were taken, the first showing prominent abnormalities of the sperm head (14.5 per cent abnormal heads: Min. 9.9 per cent, Max. 25 per cent), and the second showing prominent middle piece abnormalities (26.65 per cent abnormal middle pieces, min. 8.6 per cent, max. 36 per cent). The results of this comparison are given in Table I:—

TABLE I

Ejaculate	Nucleated prepuce	Anucleated prepuce	Boat-shaped cells	Mono-nucleated Spermatids	Anucleated Spermatids	Multi-nucleated Spermatids	Secondary Spermatocytes	Primary Spermatocytes
Normal Bulls.								
I ...	7.22	11.45	12.55	2.66	1.66	1.0	—	—
II ...	2.0	8.53	9.6	1.4	1.5	1.0	—	—
Abnormal Bulls. (Head abnormals.)								
I ...	4.66	21.0	14.6	5.0	2.0	5.5	—	—
II ...	2.20	18.66	6.6	3.66	1.0	3.0	—	—
Abnormal Bulls. (Middle piece abnormals.)								
I ...	2.25	4.99	—	4.0	3.0	3.0	—	—
II ...	2.25	14.4	2.0	2.66	5.0	1.0	—	1.0

Figures represent the average number of cells on one flood smear. It will be apparent from this table that differences between the various groups are not marked, and in view of the small samples involved only general conclusions can be drawn.

(a) *Squamous epithelial cells arising from the prepuce.*—We have not been able to confirm the finding of Haq (1948) that the number of these cells increases with successive ejaculates. While very many factors may influence the numbers of cells found, it is likely that the use of a fresh cone for each collection will

lessen the risk of contaminating subsequent samples with cells from the previous ejaculate. Thus in the groups of normal bulls and of abnormal bulls, with prominent abnormalities of the sperm head, the numbers of preputial cells found in flood smears decreased steadily between the first and third ejaculates.

Numbers of Preputial Cells per Flood Smear.

	Ejaculate I	*Ejaculate II*	*Ejaculate III*
Normal bulls ...	18.67 ...	10.64 ...	8.83
Abnormal bulls ...	29.10 ...	24.54 ...	18.80

Preputial cells in flood smears of semen containing predominantly abnormalities of the middle pieces, however, showed an increase between successive ejaculates.

The average occurrence of preputial cells was found to be greater in the case of abnormal bulls. This was found to be due to an increase in the proportion of anucleated cells, which may well be a reflection of hormonal upset in the abnormal bull. (See Table I.)

Percentage of nucleated preputial cells in the total:—

Ejaculate	*Normal bulls*	*Abnormal bulls* (head abnormalities)	*Abnormal bulls* (middle piece abnormalities)
I ...	38.6 ...	18.1 ...	31.1
II ...	19.7 ...	10.5 ...	13.5

(b) *Boat-shaped spermatogenic cells.*—It has been shown above that these cells were a less constant feature of abnormal semen than of normal semen, but that when they occurred more were found. (See Haq, 1948.) From Table I, above, it appears that their numbers are reduced when the prominent semen abnormality is of middle pieces only. Thus they occurred in 0 per cent and 33 per cent of ejaculates of such bulls, compared with 50 per cent and 84 per cent respectively in bulls showing abnormalities of the sperm head. (Average occurrence per flood smear of the groups were 2.0 and 10.6 respectively.)

The numbers of boat-shaped cells found in semen containing a high percentage of head abnormals resembled those found in the semen of abnormal bulls. Factors deleterious to sperm production first show in semen in the production of abnormal heads (Williams and Savage, 1925), more heads being affected as the factor continues to operate, being accompanied later by an increased shedding of boat-shaped cells. Thus, in Table II, the numbers of boat-shaped cells seen are set out in comparison to the abnormal head percentage. This is not surprising since these cells are not found in cases of testicular hypoplasia (Haq, 1948), when middle piece abnormalities predominate (Lagerlöf, 1934).

TABLE II

BULL:	22	22′	14	28	27	33	
Ejaculate I ...	10.3	12.3	12.2	15.3	11.6	29	% of abnormal heads.
	—	—	2	12	13	29	No. of boat-shaped cells.
Ejaculate II ...	9.6	11.3	16.0	8.6	11.3	25	% of abnormal heads.
	1.0	—	3	9	2	22	No. of boat-shaped cells.

XUM

PLATE I.—ABNORMALITIES OF THE SPERM HEAD

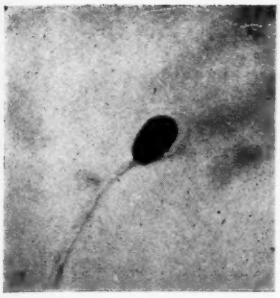


FIG. 1
Eosinophil micro round head.

FIG. 2
Eosinophil micro pear head.

FIG. 3
Eosinophil micro elongate head.

FIG. 4
Normal elongate head.

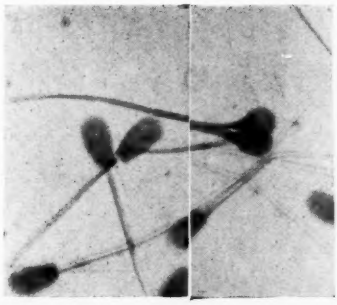


FIG. 5
Hyperbasophillic micro double head.

FIG. 6
Hyperbasophillic micro elongate head..

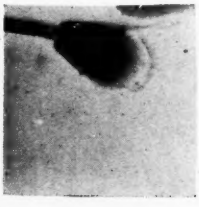


FIG. 7
Hyperbasophillic macro round head.

FIG. 8
Hyperbasophillic macro elongate head.

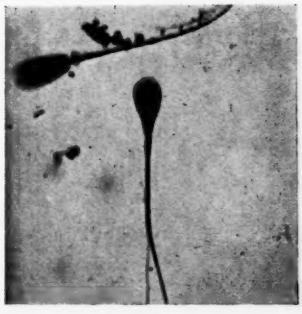


FIG. 9
Hyperbasophillic micro pear head.

(*Article by Rollinson, page* 258)

XUM

PLATE II.—ABNORMALITIES OF THE SPERM HEAD

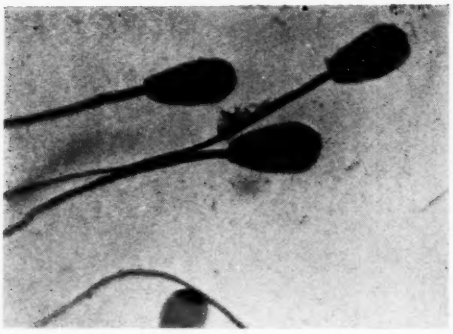


FIG. 10
Acrosomal remnant.

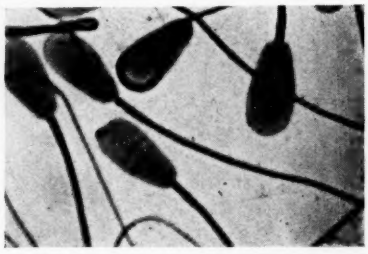


FIG. 11
Acrosomal remnant.

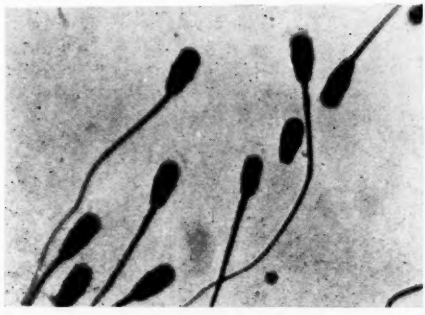


FIG. 12
Detachment of *galea capitis*.

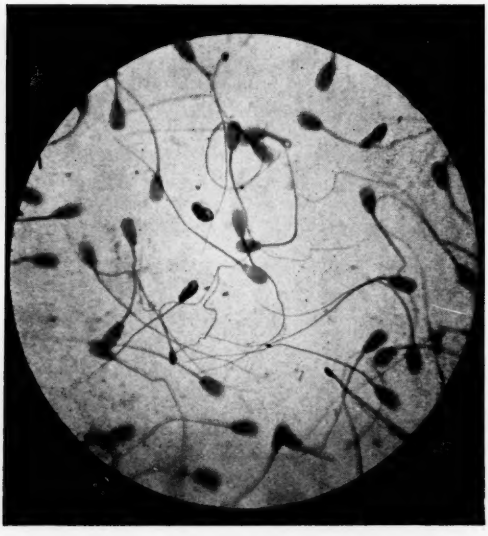


FIG. 13
Field showing hyperbasophillic micro round heads.

(*Article by Rollinson, page 258*)

PLATE III.—ABNORMALITIES OF THE SPERM MIDDLE-PIECE

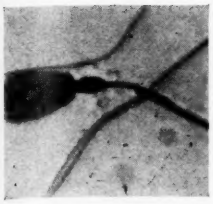


FIG. 14
Imperfect sheath of middle piece.

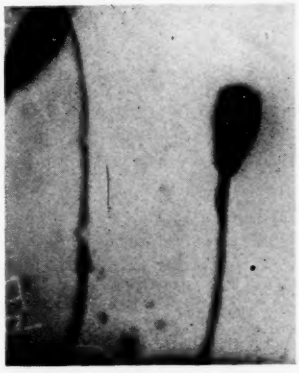


FIG. 15
Swelling of middle piece without protoplasmic drops.

FIG. 16
Swollen midle piece without protoplasmic drops.

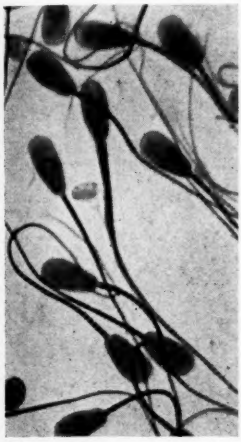


FIG. 17
Double middle piece.

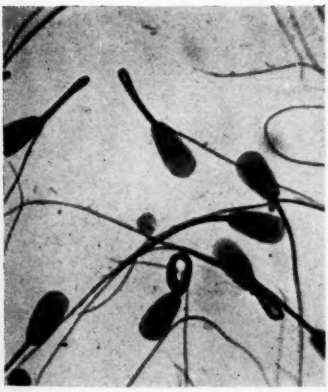


FIG. 19
Coiled middle-piece and posterior bends without protoplasmic drops.

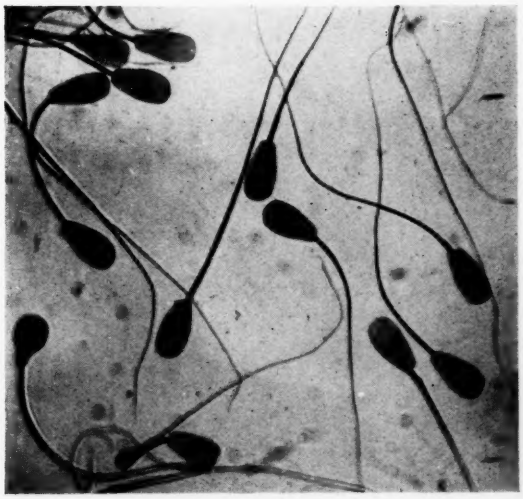


FIG. 18
Abaxial attachment of middle-piece.

(*Article by Rollinson, page 258*)

PLATE IV.—ABNORMALITIES OF THE SPERM MIDDLE-PIECE AND TAIL

FIG. 20
Anterior and posterior swellings plus protoplasmic drops.

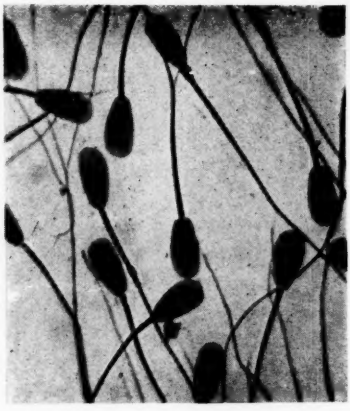


FIG. 21
Anterior and posterior swellings without protoplasmic drops.

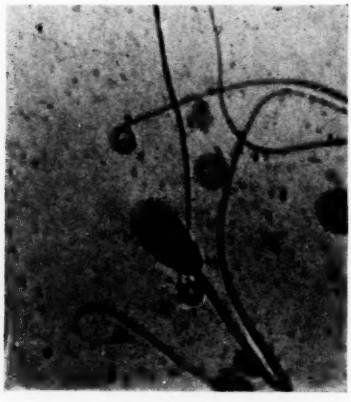


FIG. 23
Coiled tails.

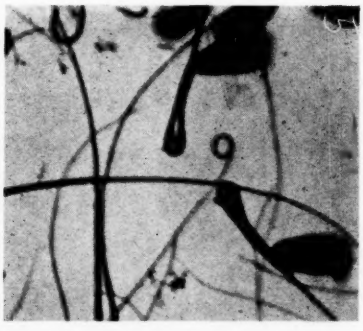


FIG. 22
Posterior bend of middle-piece plus protoplasmic drops.

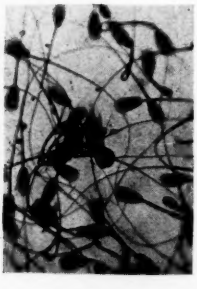


FIG. 25
Medusa formation.

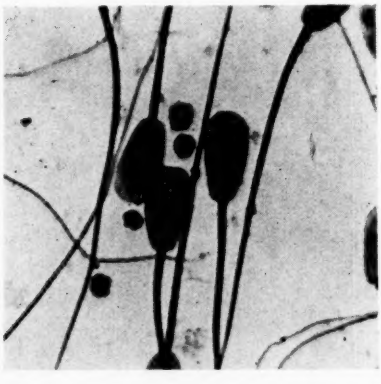


FIG. 24
Free protoplasmic drops (dark and pale).

(*Article by Rollinson, page* 258)

PLATE V.—OTHER CONSTITUENTS

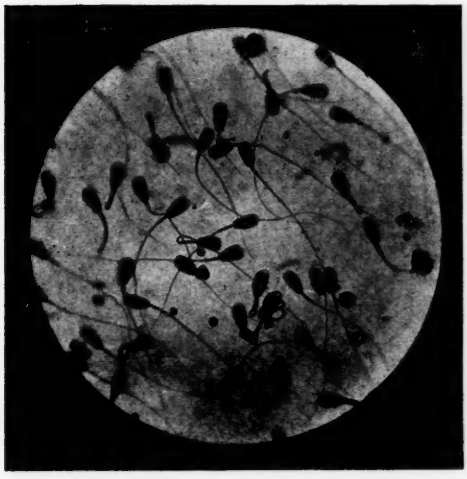


FIG. 26
Field showing large darkly-staining drops.

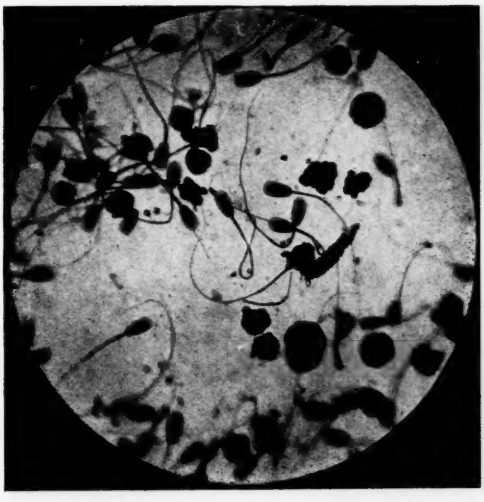


FIG. 27
Field showing mixed cells in case of seminal vesiculitis.

(*Article by Rollinson, page* 258)

XUM

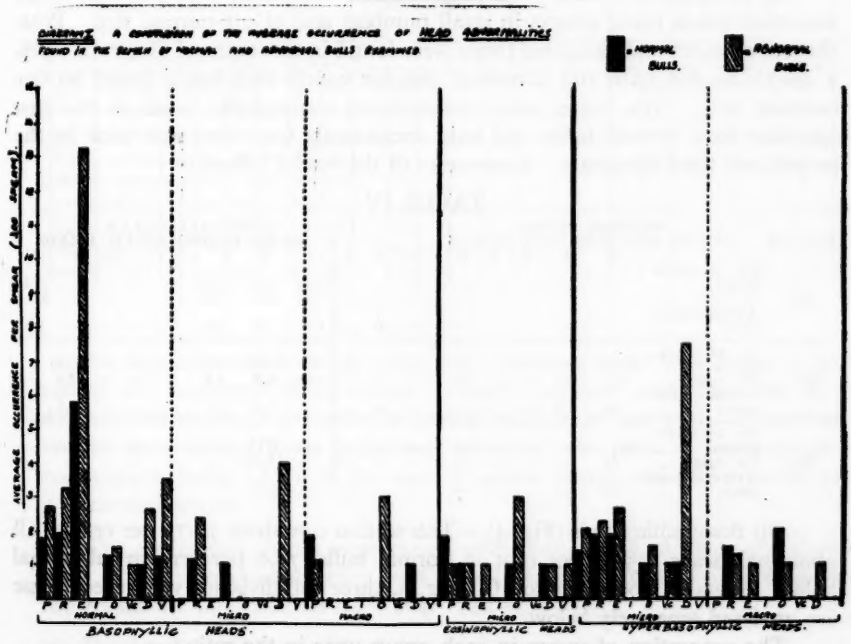
It will be evident from the above table that there is a tendency for the numbers of boat cells to follow the percentage of head abnormals.

(c) *Spermatids.*—The various types of spermatids classified showed an increase in both groups of abnormal bulls, with slightly larger numbers of mono- and multinucleated cells in the groups showing abnormality of the sperm head. More anucleated spermatids were found in the group showing abnormalities of the middle piece of the sperm.

(III) Incidence of Types of Abnormal Spermatozoa in Semen.

Abnormalities were compared by calculating the number of times each abnormality occurred as a percentage of the number of ejaculates in the group. The mean occurrence of abnormal cells in affected ejaculates was then calculated, e.g., in 14 first ejaculates of normal bulls, elongated heads of normal size and staining capacity occurred in 11, that is, 78.6 per cent; 63 such elongated heads were present, giving a mean occurrence of 5.7. The figures referred to are the actual numbers in abnormal sperm observed after classification of 300 cells, so that division of the numbers by 3 indicates the proportion as a percentage.

DIAGRAM I



(a) *Abnormalities of the sperm head* (see Diagram I).

These comprised 23.33 per cent of all abnormal forms in normal bulls, and 23.41 per cent in abnormal bulls.

(i) Tailless heads. (These calculations do not include the special case of Guernsey sperm decapitation.)—Normal tailless heads formed 11.9 per cent of

all abnormal forms in normal bulls' semen, and 7.18 per cent in the semen of abnormal bulls. Abnormal tailless heads formed 0.46 per cent and 0.64 per cent respectively. In considering tailless heads, it was found that the greater proportion were of normal morphology and staining character, the ratio of normal to abnormal heads varying from 2 : 1 to 5 : 1. The proportion of ejaculates showing tailless heads of either types was similar in both normal and abnormal bulls, with a tendency, however, to a larger average occurrence in abnormal bulls. These results are set out in the following table :—

TABLE III

		NORMAL BULLS			ABNORMAL BULLS		
Ejaculate	Type of head	No. of ejaculates	Per cent	Average occurrence	No. of ejaculates	Per cent	Average occurrence
Ei ...	N.	9/14	64.28%	7.33	17/32	53.12%	8.70
	Ab.	2/14	14.28%	1.0	8/32	25.00%	1.87
Eii ...	N.	10/15	66.66%	4.7	21/29	72.41%	10.8
	Ab.	2/15	13.33%	2.0	5/29	17.34%	3.6
Eiii ...	N.	4/4	100.00%	9.25	8/13	61.54%	6.62
	Ab.	0/4	0	0	2/13	15.38%	2.5

(ii) Eosinophillic heads (Figs. 1-3).—These comprised 0.94 per cent of all abnormal heads being always in small numbers and of sub-normal size. Pear-shaped, rounded and elongated forms were found in the semen of abnormal bulls, a double-headed form and abnormal anterior vesicle each being found on one occasion only. The writer never encountered eosinophillic heads in the first ejaculate from normal bulls, and only occasionally were they met with in the second and third ejaculates. A summary of the results follows :—

TABLE IV

		NORMAL BULLS MICRO EOSINOPHILLIC HEADS								ABNORMAL BULLS MICRO EOSINOPHILLIC HEADS							
Ejaculate		P	R	E	I	O	Vc	D	V	P	R	E	I	O	Vc	D	V
Ei	No. of ejaculations ...	—	—	—	—	—	—	—	—	2/32	2/32	2/32	—	—	—	—	1/32
	Per cent ...	—	—	—	—	—	—	—	—	6.25	6.25	6.25	—	—	—	—	3/13
	Average occurrence ...	—	—	—	—	—	—	—	—	1.0	1.0	1.0	—	—	—	—	1.0
Eii	No. of ejaculations ...	1/15	1/15	—	—	—	—	—	—	—	2/29	2/29	—	—	—	1/29	
	Per cent ...	6.6	6.6	—	—	—	—	—	—	—	6.9	6.9	—	—	—	3.4	—
	Average occurrence ...	1.0	1.0	—	—	—	—	—	—	—	1.0	1.0	—	—	—	1.0	—
Eiii	No. of ejaculations ...	1/4		—	—	—	—	—	—	—	2/13	—	—	—	—	—	—
	Per cent ...	25		—	—	—	—	—	—	—	15.38	—	—	—	—	—	—
	Average occurrence ...	1.0	—	—	—	—	—	—	—	—	1.0	—	—	—	—	—	—

(iii) Basophillic heads (Fig. 4).—This section contained 76.73 per cent of all abnormal heads (75.49 per cent in normal bulls, 77.0 per cent in abnormal bulls). As stated above, section C, b, 2, a, three sub-divisions were used; these are analysed separately below.

The proportion of sperm in each group were in the ratio :—

NORMAL SEMEN			ABNORMAL SEMEN		
Normal size.	Micro.	Macro.	Normal size.	Micro.	Macro.
19.4	0.36	1.0	71	1.64	1.0

The most frequent variation in form seen was again in the Pear, Round,

and Elongated groups. Micro-sperm and macro-sperm of normal basophillic staining characteristics were rare compared with normal-sized variant forms. The general pattern of abnormalities found was similar in both fertile and infertile semen, but differed in two points; firstly, while the frequency of occurrence was uniform, the average occurrence was greater in infertile semen than in fertile semen, and, secondly, the frequency and average occurrence of abnormalities of the *galea capitis* tended to be greater in the semen from infertile bulls. See Table V.

TABLE V NORMAL BULLS

		NORMAL BASOPHILLIC HEADS								MICRO-BASOPHILLIC HEADS								MACRO-BASOPHILLIC HEADS							
		P	R	E	I	O	V/L	D	V	P	R	E	I	O	V/L	D	V	P	R	E	I	O	V/L	D	V
E_1	NO. OF SPECS.	9/44	7/44	9/44	-	2/44	-	-	1/44	-	1/44	-	1/44	-	-	-	-	-	8/44	-	-	-	-	7/44	-
	PER CENT	20.28	15.67	20.67	-	4.32	-	-	2.29	-	2.29	-	2.29	-	-	-	-	-	18.43	-	-	-	-	15.99	-
	RELATIVE	1.66	1.75	1.72	-	1.00	-	-	1.00	-	1.00	-	1.00	-	-	-	-	-	1.00	-	-	-	-	1.00	-
E_2	NO. OF SPECS.	7/15	3/15	13/15	-	1/15	1/15	-	1/15	-	1/15	-	-	-	-	-	-	-	1/15	-	-	-	-	-	-
	PER CENT	46.67	20.67	21.67	-	6.67	6.67	-	20.00	-	6.67	-	-	-	-	-	-	-	6.67	-	-	-	-	-	-
	RELATIVE	1.55	2.00	6.33	-	1.00	1.00	-	1.33	-	1.00	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-
E_3	NO. OF SPECS.	2/3	2/3	2/3	1/3	1/3	-	1/3	-	-	-	-	-	-	-	-	-	-	2/3	-	-	-	-	-	-
	PER CENT	66.00	66.00	66.00	33.00	33.00	-	33.00	-	-	-	-	-	-	-	-	-	-	66.00	-	-	-	-	-	-
	RELATIVE	3.0	2.0	2.0	1.0	2.0	-	1.0	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	-	-
		ABNORMAL BULLS																							
E_1	NO. OF SPECS.	11/32	7/32	33/32	3/32	7/32	-	1/32	4/32	-	1/32	-	-	-	-	1/32	-	-	3/32	-	-	-	-	-	-
	PER CENT	34.37	21.87	34.37	6.25	12.50	-	3.27	12.50	-	3.12	-	-	-	-	3.12	-	-	9.24	-	-	-	-	-	-
	RELATIVE	2.20	3.50	10.60	1.00	2.00	-	1.67	5.67	-	1.00	-	-	-	-	6.00	-	-	1.00	-	-	-	-	-	-
E_2	NO. OF SPECS.	13/29	7/29	39/29	1/29	5/29	1/29	3/29	9/29	-	4/29	-	-	-	-	-	-	-	5/29	-	-	-	-	-	-
	PER CENT	41.37	24.49	134.79	3.44	17.26	3.44	10.32	31.03	-	13.79	-	-	-	-	-	-	-	17.24	-	-	-	-	-	-
	RELATIVE	3.25	3.50	19.79	1.00	1.25	1.00	2.67	3.88	-	2.00	-	-	-	-	-	-	-	1.20	-	-	-	-	-	-
E_3	NO. OF SPECS.	7/13	5/13	7/13	1/13	3/13	-	1/13	9/13	-	3/13	-	-	-	-	-	-	-	3/13	-	-	3/13	-	-	-
	PER CENT	53.83	38.48	53.82	7.69	19.78	-	7.69	30.76	-	23.07	-	-	-	-	-	-	-	23.07	-	-	23.09	-	-	-
	RELATIVE	2.57	2.40	6.60	1.00	1.00	-	1.25	3.33	-	3.33	-	-	-	-	-	-	-	1.00	-	-	3.00	-	-	-

(iv) Hyperbasophillic heads (Figs. 5-9).—Various forms were found in both normal and abnormal bulls' semen. They comprised 22.32 per cent of all abnormal forms (23.51 per cent for normal bulls, 22.06 per cent for abnormal). Smaller than normal forms were most prevalent, the ratio of micro-sperm to macro-sperm being 10 : 1 in the case of normal semen and 16 : 1 in the case of abnormal semen.

The commonest shapes encountered were pear, round, elongate and double heads in the micro-sperm group, and round heads in the macro-sperm group. The results are tabulated on page 264. (Table VI.)

(b) *Abnormalities of the middle piece* (see Diagram II).

These formed 58.27 per cent of abnormal forms in normal bulls, and 65.01 per cent in abnormal bulls.

(i) Necks.—Morphological abnormality of the neck was only rarely

detected during these investigations. Breakage at this point is, however, excluded, having been already dealt with under the heading of tailless heads, in the section on abnormalities of the head.

TABLE VI

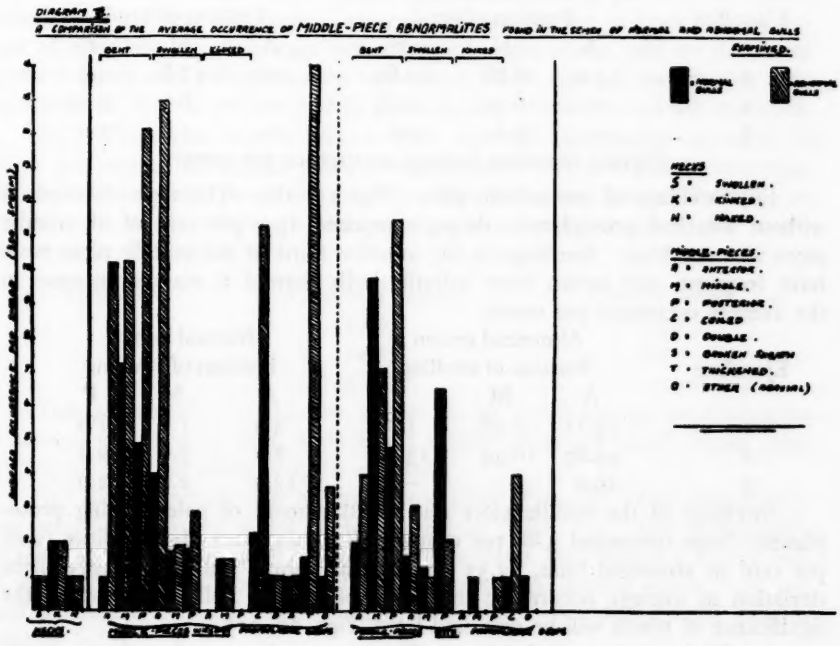
Ejaculate		Micro-Hyperbasophilic Heads.						Macro-Hyperbasophilic Heads.					
	~	P	R	E	O	Vc	D	P	R	E	O	D	V
E_1	No. of Ejaculates	3/16	5/16	6/16	1/16	-	1/16	-	3/4	-	-	-	-
	Per Cent	21·4	36·7	42·9	7·1	-	-	-	21·4	-	-	-	-
	No. Occur	1·0	1·8	1·5	1·0	-	-	-	3·0	-	-	-	-
E_2	No. of Ejaculates	6/15	6/15	6/15	-	-	-	-	2/15	-	2/15	-	-
	Per Cent	40·2	22·7	40·	-	-	-	-	13·3	-	13·3	-	-
	No. Occur	1·5	1·5	2·2	-	-	-	-	1·0	-	2·0	-	-
E_3	No. of Ejaculates	2/3	2/3	-	-	-	-	-	1/3	-	-	-	-
	Per Cent	66	66	-	-	-	-	-	33	-	-	-	-
	No. Occur	2·0	2·0	-	-	-	-	-	1·0	-	-	-	-
Abnormal Bulls													
E_1	No. of Ejaculates	8/32	12/32	12/32	8/32	1/32	3/32	-	1/32	2/32	1/32	-	-
	Per Cent	43·8	62·5	62·5	6·25	3·1	9·4	-	12·5	6·3	9·4	-	-
	No. Occur	1·7	2·3	2·6	2·0	1·0	3·0	-	1·5	1·0	1·0	-	-
E_2	No. of Ejaculates	18/29	15/29	15/29	1/29	-	3/29	-	1/29	-	1/29	1/29	-
	Per Cent	62·0	51·8	48·3	3·4	-	10·3	-	3·4	-	3·4	3·4	-
	No. Occur	2·3	2·3	2·6	1·0	-	3·0	-	1·0	-	1·0	1·0	-
E_3	No. of Ejaculates	3/13	3/13	4/13	1/13	-	-	-	2/13	1/13	-	-	-
	Per Cent	23·1	23·1	30·8	7·7	-	-	-	15·4	7·7	-	-	-
	No. Occur	2·0	1·7	2·3	1·0	-	-	-	1·0	1·0	-	-	-

Neck abnormalities, when expressed as a proportion of the total middle piece abnormalities, comprised 1.92 per cent (4.2 per cent in normal bulls, 1.46 per cent in abnormal bulls). Kinked necks (with the head at an angle to the middle piece) were the most frequent abnormality, constituting 92 per cent of the abnormal necks. The average occurrence of kinked necks on smears showing them (42.8 per cent of total) varied from 1 to 2.66 per smear and was similar in both normal and abnormal bulls. The abnormality appears to have little significance, and there is the greatest possibility that it may be due to mechanical damage.

(ii) Bends of the middle piece.—Bends of the middle piece, without

attached protoplasmic drops, comprised 32.88 per cent of middle piece abnormalities (33.81 per cent in normal bulls, 32.67 per cent in abnormal bulls). Bends of the middle third of the middle piece were seen in from 53 to 80 per cent of the ejaculates in the various groups, there being little difference in this respect between semen from normal and abnormal bulls. The average occurrence of the abnormality was usually much greater in abnormal semen, but the figure was also high for middle bends in the first ejaculates of normal bulls.

DIAGRAM II



Bends of the posterior third of the middle piece (Figs. 19, 22) appeared to be more frequent in the semen of abnormal bulls, though a high percentage was seen in third ejaculates from normal bulls; this was most probably due, however, to the small numbers of ejaculates in this group. The average occurrence of this abnormality was much greater in the case of abnormal semen.

Ejaculate		*Abnormal sperm*		*Normal sperm*
I	...	16.24	...	3.83
II	...	11.68	...	5.57
III	...	14.42	...	5.66

(These figures represent abnormal sperm per smear.)

Bends of the middle piece, with attached protoplasmic drops, comprised 18.28 per cent of middle piece abnormalities (27.4 per cent for normal bulls and 16.5 per cent for abnormal bulls). The frequency of occurrence varied somewhat between ejaculates, as also did the average occurrence per smear. A similar pattern was obtained to that mentioned above in the case of bends of the middle third of the middle piece, for normal first ejaculates again showed a high average occurrence per smear. This may well be taken as a physiological change in the sperm which becomes apparent in first ejaculates when a bull has not served for some time.

Ejaculate	Abnormal semen Position of bend			Normal semen Position of bend		
	A	M	P	A	M	P
1 ...	4.0	8.08	10.63	2.0	17.8	4.4
2 ...	—	6.54	11.75	—	6.7	5.25
3 ...	—	2.0	14.2	—	1.0	1.0

(Figures represent average occurrence per smear.)

(iii) Swellings of the middle piece (Figs 15, 16).—The type classified as without attached protoplasmic drops, comprised 13.9 per cent of all middle piece abnormalities. Swellings in the anterior third of the middle piece were most frequent, and semen from infertile bulls showed a marked increase in the average occurence per smear.

Ejaculate	Abnormal semen Position of swelling			Normal semen Position of swelling		
	A	M	P	A	M	P
1 ...	13.11	2.28	1.6	3.9	1.5	1.0
2 ...	44.83	10.34	13.88	2.0	2.0	2.0
3 ...	29.2	—	—	13.0	2.0	2.0

Swellings of the middle piece due to attachment of pale staining protoplasmic drops comprised 3.88 per cent of all middle piece abnormalities (2.22 per cent in abnormal bulls, 12.33 per cent in normal bulls). A very slight deviation in average occurrence in favour of normal bulls was evident, the significance of which will be discussed later (Figs. 20, 21).

(iv) Kinks of the middle piece.—This abnormality was found very rarely during the investigation, forming 0.12 per cent of middle piece abnormalities when without attached protoplasmic drops, and 0.043 per cent with protoplasmic drops attached. When they occurred, the average number per smear was greater in normal semen.

(v) Double middle piece (Fig. 17).—Duplication of the middle piece was rarely encountered, the number representing 0.14 per cent of all middle piece abnormalities (0.66 per cent in normal semen, 0.056 per cent in infertile semen).

(vi) Coiled middle pieces (Fig. 19).—A number of sperm showing this abnormality, but without associated protoplasmic drops, was seen in a high proportion of all ejaculates, both normal and abnormal. They represented 14.01 per cent of all middle piece abnormalities (6.08 per cent in normal semen, 15.47 per cent in abnormal semen). The average occurrence per smear was

constantly and markedly increased in abnormal semen; and the striking consistency of this finding seems to point to some significance in infertility. In semen from infertile bulls, the average occurrence per smear was between 11-14 (3.6 to 4.6 per cent), while in fertile semen the occurrence was 2.0-3.5 per smear (0.6 to 1.1 per cent). From these figures, it would appear that when sperm show this abnormality in numbers greater than 6 per smear, or 2 per cent, infertility can be suspected.

Coils surrounding pale staining protoplasmic drops were rarely encountered.

(vii) Broken sheath (Fig. 14).—Sperm showing this type of deviation formed only 0.43 per cent of all middle piece abnormalities (0.79 per cent in normal semen, 0.36 per cent in abnormal semen). They occurred in from 6 to 25 per cent of ejaculates at an average occurrence of 1 per smear, and no difference between fertile and infertile semen was noted. This type of abnormality may possibly arise from a swollen middle piece during preparation of the specimen.

(viii) Thickened middle piece.—This type of abnormality occurred in 11.55 per cent of all middle piece abnormalities (13.27 per cent in abnormal semen, 2.65 per cent in normal semen). The occurrence ranged from 32 to 57 per cent of ejaculates, and the average occurrence per smear was much increased in abnormal semen.

Ejaculate		*Abnormal semen*		*Normal semen*
1	...	12.0	...	1.72
2	...	14.25	...	1.2
3	...	32.8	...	—

This abnormality would also appear to be significant in the evaluation of semen, and if more than 6 thickened middle piece per smear (2 per cent) are found, then infertility may be expected.

(ix) Abaxial attachment of the middle piece (Fig. 18).—This abnormality was seen to a marked extent in only one bull (ABR 12). The abnormality occurred in from 13.33 to 31.2 per cent of ejaculates, and formed 2.67 per cent of all middle piece abnormalities (3.04 per cent in abnormal semen, 0.78 per cent in normal semen). The average occurrence was raised in the case of infertile bulls.

Ejaculate		*Abnormal semen*		*Normal semen*
1	...	6.1	...	1.0
2	...	7.12	...	1.0
3	...	—	...	1.0

(b) *Abnormalities of the tail.*

These formed 3.17 per cent of all abnormal forms in normal bulls, and 0.79 per cent of abnormal forms in abnormal bulls.

Headless tails formed 3.17 per cent of all abnormal forms in normal bulls, and 2.97 per cent of abnormal forms in abnormal bulls. They were not subdivided into normal and abnormal forms, since it was felt that the numbers would be too small to show any appreciable changes.

(i) Headless tails (excluding decapitation in Guernsey semen).—The

proportion of ejaculates showing headless tails did not greatly vary as between normal and abnormal bulls, though there was a tendency for a more frequent occurrence in semen from abnormal bulls. The average occurrence per smear was consistently greater in abnormal semen. This can be seen from the following figures:—

Ejaculate		*Abnormal*		*Normal*
1	...	3.04	...	1.87
2	...	3.59	...	1.87
3	...	4.25	...	3.66

(ii) Coiled tails (Figs. 22, 23).—These were the most consistently met with of all tail abnormalities. They formed 78.4 per cent of all abnormal tails (68.29 per cent for normal bulls, 87.23 per cent for abnormal bulls). The average occurrence per smear remained fairly uniform in the samples examined.

(iii) Double tails.—Only one sperm having a double tail was seen in one ejaculate from a normal bull, and the writer therefore considers them as of extreme rarity.

(iv) Bent tails.—Abnormal tails of this type accounted for 10.22 per cent of all tail abnormalities (12.19 per cent for normal bulls, 8.52 per cent for abnormal bulls). Their average occurrence per smear remained at a uniformly low level throughout.

(v) Tufted tails.—These comprised 3.41 per cent of all tail abnormalities (2.43 per cent for normal bulls, 4.25 per cent for abnormal bulls). This abnormality occurred only occasionally and appeared to be without significance.

(vi) Kinked tails.—These were not found during the present investigation.

(vii) Broken tails.—These comprised 14.63 per cent of all tail abnormalities, being encountered only in normal bulls. It would appear that this abnormality arises from mechanical damage in dense semen.

Free protoplasmic drops

These were classified in two types and separately recorded.

(a) Pale staining drops (Fig. 24).—This type of drop takes a pale eosinophil stain. They occurred in 78.60 per cent of all ejaculates (93.93 per cent of normal ejaculates, 71.62 per cent of abnormal ejaculates). The average occurrence per smear of this type of drop was slightly reduced in the case of abnormal semen. With iron hæmatoxylin, these drops also take a pale stain.

Ejaculate		*Abnormal*		*Normal*
1	...	7.78	...	10.05
2	...	11.04	...	13.28
3	...	11.14	...	17.33

(6) Darkly staining protoplasmic drops (Fig. 26).—This type of protoplasmic drop takes a deep-red colour on smears stained by hæmalun and eosin, or stains

deeply with iron hæmatoxylin. They were most frequently about 2 μ in diameter, but in exceptional cases (Fig. 25) they reached 12 μ in diameter, and averaged 5.7 μ. They were found in 71.03 per cent of all ejaculates (75.15 per cent of normal ejaculates and 68.91 per cent of abnormal ejaculates). The average occurrence per smear was very slightly increased in abnormal semen.

Ejaculate		*Abnormal*		*Normal*
1	...	8.89	...	6.50
2	...	6.65	...	5.66
3	...	6.78	...	4.33

(IV) Relationship of Abnormalities to Other Characteristics of Semen and to Fertility Rate

(A) *Other characteristics*

Since Williams and Savage (1920) pointed out that morphologically abnormal sperm were found in infertile bulls, there have been many reports of the varying ratios which may be found (Lagerlof, 1934; Herman and Swanson, 1941; Trimburger and Davis, 1942). Mention is made in each report of varying types of abnormal sperm, but little agreement exists as to which forms most frequently occur. In a number of cases the numerically superior types of abnormals are such as would be produced by mechanical damage. Both Herman and Swanson and Trimburger and Davis list tailless heads, broken tails and broken middle pieces as of frequent occurrence. The conclusions drawn from available literature on the studies of abnormalities are limited.

The present investigation was undertaken to see if more specific prediction could be made. For the purpose of comparison of sperm the available material has been divided into five groups according to the characteristics of the recent history of the animal, viz. :—

(i) Fertile bulls.

(ii) Infertile bulls—12 cases (41.38 per cent): (a) 41 per cent to 65 per cent fertility rate—3 cases (10.34 per cent); (b) 21 per cent to 40 per cent fertility rate—3 cases (10.34 per cent); (c) 4 per cent to 20 per cent fertility rate—6 cases (20.68 per cent).

(iii) Sterile bulls—7 cases (24.13 per cent). These animals had been fertile earlier in their careers, but had later declined until unable to produce calves—i.e., acquired sterility.

(iv) Congenitally sterile bulls—6 cases (20.68 per cent). These animals were never fertile.

(v) *Impotentia cœundi*—4 cases (13.79 per cent): (a) congenital—1 case (3.45 per cent); (b) acquired—3 cases (10.34 per cent).

The characteristics of the semen from these groups have been compared in respect of volume per ejaculate, motility at collection, density, and *pH*. The

total density of ejaculate has been calculated (density per cu. mm. × volume × 1,000), and following the recommendation of Hotchkiss (1945), the effective density has been calculated by subtracting the percentage of sperm classified as abnormal from the total density.

Effective density = total density × (100 — per cent abnormal).

(i) Fertile bulls.

The fertility rates as shown from an analysis of the service records over three months or more averaged 63.6 per cent over-all fertility, with a range of 50 per cent to 90.3 per cent. The semen characteristics of the groups are set out in the following table:—

TABLE VII

Characteristic		Ei	Eii	Eiii
Volume (ml.) ...	Average	3.60	4.76	4.77
	Range	0.7–11.0	1.5–8.3	2.8–8.2
Density (per cu. mm.)	Average	795,071	736,643	590,750
	Range	331,000–1,672,000	295,000–980,000	371,000–792,000
Motility at collection	Average	61.7 x 3.5	72 x 3.9	67.5 x 3.5
	Range	(40 x 3) – (90 x 5)	(40 x 3) – (90 x 5)	(50 x 3) – (90 x 4)
pH	Average	6.21	6.39	6.40
	Range	5.8–6.8	5.8–6.8	5.8–6.8

It will be seen from these figures that:—

(a) There is an increase in volume and a decrease in density with successive ejaculations, confirming the work of Haq (1948). The volume of the second and third ejaculates is approximately 142 per cent of the first ejaculate;

(b) The fall in density between ejaculates is not large, Eii being 92.64 per cent of Ei, and Eiii 74.3 per cent of Ei;

(c) The motility rating is least in the first ejaculate; and

(d) The *pH* is uniformly low, but increases directly as the volume increases.

(ii) Infertile bulls.

(*a*) Fertility rate of over 41 per cent.—This group consisted of 3 bulls (ABR 13, ABR 17, ABR 36), with an average fertility rate of 59.8 per cent (54.5 per cent to 65.0 per cent). Results of examination are as follows:—

TABLE VIII

Characteristic		Ei	Eii
Volume (ml.)	Average	3.76	4.13
	Range	2.3–6.6	2.6–6.8
Density (per cu. mm.)	Average	504,666	355,000
	Range	344,000–682,000	144,000–678,000
Motility at collection	Average	37.5 x 2.75	37.5 x 3.0
	Range	(10 x 2) – (70 x 4)	(10 x 2) – (70 x 4)
pH	Average	6.45	6.5
	Range	5.8–7.4	6.4–6.8

These semen characteristics, when compared to normal ejaculates, show the following differences:—

(a) While the volumes are similar, the increase in volume for the second ejaculate is proportionately less, Eii being 110 per cent of Ei;

(b) The fall in density between the two ejaculates is proportionately greater in this group, Eii being 70.3 per cent of Ei;

(c) The average density per ejaculate is reduced below normal, the first ejaculate being 63.45 per cent of normal and the second ejaculate being 48.23 per cent of normal;

(d) The average motility at collection was reduced, this being due mainly to alteration of the percentage showing motility, rather than to change in the vigour of movement; and

(e) The *pH* was slightly higher in this group and again follows directly the volume of ejaculate.

(*b*) Fertility rate of 21 per cent to 40 per cent.—Group consisted of 3 bulls (ABR 21, ABR 22, ABR 42), and 4 first ejaculates, 5 second ejaculates, and 2 third ejaculates were examined. The average fertility rate for the group was 27.6 per cent (range 22.5 per cent to 30.9 per cent). Results of examination are as follows:—

TABLE IX

Characteristic		Ei	Eii	Eiii
Volume (ml.) ...	Average	3.25	2.48	1.95
	Range	2.2–5.2	0.8–5.2	1.8–2.1
Density (per cu. mm.)	Average	631,500	341,200	221,000
	Range	270,000–1,196,000	106,000–776,000	176,000–266,000
Motility at collection	Average	52.5 x 3.0	33 x 2.6	25 x 2.5
	Range	(20 x 2) – (80 x 4)	(5 x 2) – (60 x 3)	(10 x 2) – (40 x 3)
pH	Average	6.55	6.8	6.7
	Range	6.6–7.0	6.4–7.4	6.6–6.8

When compared to normal ejaculates the following differences are shown:—

(a) The average volume per ejaculate shows a steady decline between the first and third ejaculates. The second ejaculate is 76.3 per cent of the first (normal 142 per cent), and the third 60 per cent of the first;

(b) The density also shows a steady decline, the average density of the second ejaculate being 54.05 per cent of the first, and the third being only 35 per cent of the first ejaculate (normal 92.6 per cent and 74.3 per cent respectively);

(c) The motility rating at its best was greater than in the more fertile group, though less than the best normal. There was a severe drop in percentage motile between the first and third ejaculates, the latter being only 49 per cent of the former. The vigour of motility remained at 3 or a little below; and

(d) The *pH* was still further increased above normal, the increase continuing in spite of the fall in volume between the first and third ejaculates.

(*c*) Fertility rate of 4 per cent to 20 per cent.—This group consisted of

6 bulls (ABR 4, ABR 5, ABR 12, ABR 14, ABR 28, ABR 32), having an average fertility rate of 19.4 per cent to 20 per cent. Ten first ejaculates, 8 second, and 2 third were examined. Of these, one first and one second contained no sperm at the time of examination. Results of examination are as follows:—

TABLE X

Characteristic		Ei	Eii	Eiii
Volume (ml.) ...	Average	3.7	4.23	2.7
	Range	0.8–8.4	1.2–8.1	2.4–3.0
Density (per cu. mm.)	Average	624,000	599,000	303,000
	Range	90,000–895,000	202,000–933,000	147,000–460,000
Motility at collection	Average	41.0 x 2.6	47.5 x 2.75	23.3 x 2.0
	Range	0 – (70 x 4)	0 – (80 x 4)	0 – (60 x 4)
pH	Average	6.67	6.52	6.7
	Range	6.2–8.4	6.9–7.0	6.6–7.0

The numerical evaluation of this group showed a close similarity in general trends to that of fertile bulls:—

(a) In volume, Eii was 114 per cent of Ei, but Eiii was only 73 per cent of Ei;

(b) In density, Eii was 96 per cent of Ei, while Eiii was 54 per cent, the difference being less marked than in the previously examined infertile bulls;

(c) The motility rating was fairly uniformly sub-normal, with the type of motility very slightly less than the previous infertile groups; and

(d) The *pH* was higher than the average for normal bulls and varied inversely to the volume.

(iii) Sterile bulls (acquired sterility).

This group comprised 7 bulls (ABR 6, ABR 10, ABR 16, ABR 33, ABR 34), all of which had sired calves normally during their earlier years. Their ages averaged $4\frac{1}{4}$ years (range $2\frac{1}{2}$ to $8\frac{1}{2}$ years). Three of the 7 bulls were used on large farms having 2 or more stock bulls, and cows returning to them were known to hold readily to other bulls. Six first, 5 second, and 3 third ejaculates were examined. The results of examination are as follows:—

TABLE XI

Characteristic		Ei	Eii	Eiii
Volume (ml.) ...	Average	3.23	3.9	3.3
	Range	2.3–6.3	2.4–6.3	2.3–3.9
Density (per cu. mm.)	Average	376,000	634,000	391,000
	Range	16–592,000	292–1,132,000	56–684,000
Motility at collection	Average	28.57 x 1.71	41.43 x 2.53	40 x 2.25
	Range	0 – (60 x 3)	0 – (80 x 4)	0 – (60 x 3)
pH	Average	6.76	6.45	6.6
	Range	6.0–7.5	6.0–7.0	5.8–7.2

In this group of bulls, semen characteristics showed the following tendencies:—

(a) Slight rise in the volume of the second ejaculate, Eii being 121 per cent of Ei, and Eiii 102 per cent of Ei;

(b) An increase in density of the second ejaculate. This was not entirely due to the large second ejaculate of ABR 4, for, excluding this ejaculate, the increase was still apparent. Eii was 168 per cent of Ei, and Eiii 104 per cent of Ei;

(c) While motility rating was of moderate dimension, that for the first ejaculate was appreciably lower than for succeeding ejaculates. This was unlike any other group; and

(d) The *pH* value tended to be high and varied inversely to the volume.

(iv) Sterile bulls (congenital sterility).

This group comprised 6 bulls (ABR 7, ABR 15, ABR 27, ABR 35, ABR 38, ABR 8), all of which were completely unable to sire calves. The average age of the group was 1 year 8 months (range 1 year to 2 years 8 months). All except ABR 8 (Friesian) were highly pedigreed animals, 3 being of the Jersey breed and 2 of the Guernsey breed; these latter both showed decapitated sperm and are dealt with separately. Two cases (ABR 8 and ABR 35) were diagnosed as testicular hypoplasia, one case being unilateral and one bilateral.

Five first ejaculates, 6 second ejaculates, and 3 third ejaculates were examined (that of the 2 Guernsey bulls having decapitation of the sperm excluded). The results of examination were as follows:—

TABLE XII

Characteristic		Ei	Eii	Eiii
Volume (ml.) ...	Average	2.25	1.72	2.10
	Range	0.8–4.4	0.5–3.5	1.4–3.6
Density (per cu. mm.)	Average	590,000	276,000	225,000
	Range	367,000–960,000	258,000–297,000	158,000–300,000
Motility at collection	Average	12.0 x 1.5	5.85 x 1.43	10.25 x 1.50
	Range	0–(60 x 3)	0–(20 x 3)	(1 x 1)–(30 x 3)
pH	Average	6.5	6.85	6.7
	Range	6.0–7.4	6.6–7.6	6.6–6.8

The semen characteristics varied from those of fertile bulls in the following respects:—

(a) The volume of ejaculate was small, commensurate with the age of the bull (Anderson, 1945). The second ejaculate was 77.8 per cent of the first, and the third 93 per cent;

(b) The density progressively decreased between first and third ejaculates, so that the second ejaculate was 46.8 per cent of the first, and the third 38.2 per cent;

(c) The average motility was of the lowest level, although a maximum of 60 per cent was occasionally seen; and

(d) The *pH* tended to be high and varied inversely with the volume.

(*To be concluded*)

XUM

OBSERVATIONS ON THE ORIENTATION OF CERTAIN LUNGWORMS IN THE RESPIRATORY TRACTS AND ON THEIR FEEDING HABITS

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THE normal habitat of mature members of the genus Dictyocaulus in ruminants, and those of the genus Metastrongylus in swine, is the bronchi and trachea, where they pass the adult stage of their life cycle, irritating the mucous membranes, setting up bronchitis and bronchopneumonia. According to the literature, these parasites lie in coils and suck blood. Monnig (1938), describing the pathogenesis of *Dictyocaulus filaria* in sheep, makes the following statement: "The worms live in the small bronchi where they suck blood and irritate the mucosa, producing catarrhal bronchitis." Udall (1943), discussing the lungworms in general, from the parasitological point of view, states that "the habitat of the mature worms is in the bronchi and trachea, where they are grouped in coils. These parasites suck blood, irritate the mucous membranes and cause bronchopneumonia." Hung (1926), investigating the histopathology of the lungworm *Metastrongylus apri* from swine, found that "the blood vessels between the bronchopneumonia parts are generally enlarged and contain numerous eosinophiles, and red blood corpuscles are frequently found within the intestines of the worms, indicating that the worms feed on blood."

Porter (1936), examining sections of lungs of swine naturally infested with undetermined species of lungworms, and sections of guinea-pigs' lungs, experimentally infected with *Metastrongylus apri,* found that the intestinal contents of lungworms in swine resemble the contents of the inflammatory exudate in the bronchi, namely, eosinophilic and neutrophilic polymorphonuclear leucocytes, lymphocytes and desquamated epithelial cells, and in some instances erythrocytes. He therefore concludes that these parasites appear to ingest the inflammatory exudate, and that the erythrocytes and leucocytes are merely elements of this exudate.

From the above statements it seems that the opinion of most workers about lungworms in general is that they lie in coils and feed by sucking blood. Porter's evidence regarding the ingestion of the inflammatory exudate by the lungworms in swine would seem to conflict with Hung's statement that they feed on blood. Hence a study of the way lungworms are naturally situated in the bronchial tree was undertaken, in the hope that some light might be thrown on the nature of their diet and method of feeding. At the same time the composition of their gut contents was examined biochemically and microscopically.

Orientation of Certain Lungworms in the Bronchial Tree

For the purpose of this investigation, 31 pairs of lungs from cattle naturally infected with *Dictyocaulus viviparus,* 10 pairs of lungs from sheep naturally infected with *Dictyocaulaus filaria,* and 10 pairs of lungs of swine infected with

Metastrongylus apri, were examined. Animals from which these lungs were collected were: (1) killed as beyond hope of recovery; (2) recently dead; or (3) killed for their meat, and in each case care was taken to carry out the post-mortem examination as quickly as possible after death and to reduce the amount of manipulation to a minimum when removing the lungs from the thorax. The trachea was opened longitudinally, using a sharp knife, and the branches of the bronchial tree similarly exposed by means of a long, sharp pair of scissors. Groups of worms were carefully removed, using two mounted needles, parallel to each other, and placed on slides moistened with lacto-phenol, and then examined under a dissecting microscope. It was found that these parasites normally lay in the bronchial tree with their heads directed towards the bronchioles and their tails in the general direction of the trachea (Fig 1). The majority of the worms were found clogging the deepest bifurcations of the tracheal tube. In no case were these parasites observed with their heads facing upward and outward, except when displaced by movement and found lying free in the lumen of larger bronchi. When such displacement had taken place, however, owing either to removal of the carcass or manipulation of lungs during extraction and in cases of heavy infestation, large numbers of worms were found in groups, coiled round each other in the main bronchi, as previously described by Udall.

Some outbreaks of husk were seen in the earliest stages before larvæ were present in fæces. Examination of lungs from animals dying during this period revealed that most of the parasites were located in the terminal branches of the bronchi. Moreover, the parasites were so small at this stage, not having achieved maturity, that they were quite difficult to detect by naked eye (Fig. 2). The main bronchi showed so few lungworms that, had the bronchi not been opened as far as the bronchioles, a diagnosis of husk would not have been established.

The Nature of the Diet of D. viviparus, D. filaria and M. apri

Bearing in mind the possible constituent of the diet of these parasites, a chemical examination was carried out to detect blood or its resorption products. For this purpose a number of fresh specimens of *D. viviparus, D. filaria* and *M. apri* were collected from their hosts, namely, cattle, sheep and pigs, respectively, and washed several times in physiological saline. The heads and tails of some of each were cut and the intestines withdrawn by gentle traction at the anterior end, and then washed quickly again in distilled water to remove any trace of body fluid.

The benzidin test was applied on:—

(1) The saline in which these worms were last washed before extraction of their guts.

(2) The intestinal tracts themselves.

The result was negative for the saline washings, but was positive in the case of the intestinal tracts of all three parasites, thus showing that the intestinal tracts of these parasites contain blood elements, or its resorption products.

XUM

Microscopical Examination of the Gut Contents of D. viviparus, D. filaria & M. apri

Live, fresh specimens of the three above-mentioned parasites were fixed in formol-saline 10 per cent and then taken through alcohol for dehydration and cleared in cedar oil. To prevent collapse during the process of passing through the wax, the tails were cut and the worms arranged in a parallel manner with their heads facing in the same direction. Sections were cut from the œsophageal region, anterior and posterior parts of intestine, and stained with hæmatoxylin-eosin, muci carmine and Leishman stains.

1. *Dictyocaulus viviparus.*

Œsophageal region. Nothing was observed in the lumen of the œsophagus in any instance.

Measurement of the œsophageal lumen. The maximum dilation of the œsophageal lumen at its beginning, that is, just behind the buccal capsule, was determined by measuring ten sections from ten worms. This was found to range from 12 μ - 20 μ.

Anterior region of the intestine. Examination of these sections showed the gut to contain eosinophiles neutrophilic polymorphonuclear leucocytes, lymphocytes, desquamated bronchial epithelial cells and erythrocytes.

Posterior region of the intestine. These sections showed the gut at that part of the worms' intestine to contain similar elements as the above mentioned. Some of the sections showed cells that could not be clearly identified, possibly owing to the fact that they had been partly digested. (Fig. 3.)

2. Sections of *Dictyocaulus filaria.*

Œsophageal region. In some of these sections leucocytes were seen in the lumen of the œsophagus.

Measurement of the œsophageal lumen. The distance which approximates the maximum dilation of the beginning of the œsophageal lumen was found to range from 14 μ - 22 μ.

Anterior and posterior region of the intestine. Examination of these sections showed the same elements as observed in similar sections of *D. viviparus.* In some sections of this parasite, especially of the anterior part, erythrocytes constituted the majority of cell elements.

3. *Metastrongylus apri.*

Œsophageal region. Nothing was observed in the lumen of the œsophagus.

Measurement of the œsophageal lumen. The distance representing the maximum dilation of the œsophageal lumen at its beginning was found to range from 12 μ - 18 μ.

Anterior and posterior parts of the intestines. These showed a similar picture to that observed in sections of *D. viviparus.*

In none of the sections examined were eggs or larvæ observed among the intestinal contents of these parasites.

PLATE I

FIG. 1
End part of tracheal tube in left diaphragmatic lobe of pig's lung, illustrating orientation of lungworms. x 3

FIG. 2
Immature *Dictyocaulus viviparus* collected from a Jersey cow. Notice the small size and greyish appearance of the worms which make them difficult to detect.
Normal size

(Article by Soliman, page 274)

PLATE II

FIG. 3
Cross-section of posterior part of intestine of *Dictyocaulus viviparus*, stained hæmatoxylineosin, showing contents of intestine: (1) two erythrocytes; (2) two lymphocytes; (3 and 4) desquamated bronchial epithelial cells, one partly digested; (5) polymorphonuclear leucocyte. x 450

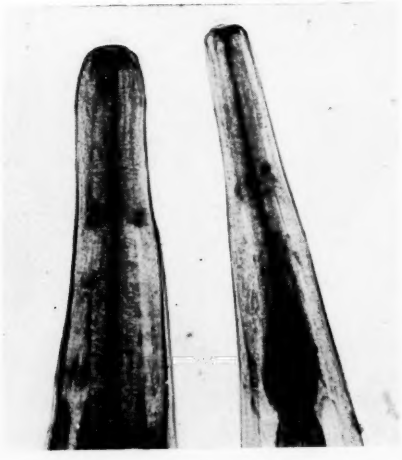

FIG. 4
Dictyocaulus viviparus ♀ and ♂. Notice the simple nude mouth parts with the small shallow buccal capsule. x 60

FIG. 5
Metastrongylus apri. Notice the simple nude mouth parts with the six aural papillæ. x 60

(Article by Soliman, page 274)

Examination of the Bronchial Exudate

Examination of the bronchial exudate from the foregoing cases in wet and stained preparations, showed the following:—

In cases where the lungworms were immature this exudate was found to be composed of mucin, leucocytes, desquamated epithelial cells, variable numbers of erythrocytes and the worms which were in these cases hardly to be seen by the naked eye while in the bronchial tree. Where lungworms were mature, and this was the case in the majority, there were also eggs and larvæ in this exudate.

Discussion

The presence of lungworms in the respiratory tracts leads to a variable degree of bronchitis in the host. As a result of this inflammatory process, an exudate collects. It is mucoid at the beginning and is composed mainly of leucocytes, desquamated bronchial epithelial cells and a variable number of erythrocytes, coming from the congested blood vessels. Later on, when these worms reach maturity, the exudate contains also eggs and larvæ. Examination of sections of the gut of *Dictyocaulus viviparus, D. filaria* and *M. apri,* cut at intervals along its length, showed that the contents of the intestines of these worms simulate the contents of the inflammatory exudate, except that there are no eggs or larvæ.

The measurements of *D. viviparus* eggs ranges from 82 μ - 88 μ long and from 33 μ - 38 μ in breadth; that of *D. filaria* ranges from 112 μ - 138 μ long by 69 μ - 90 μ in breadth; while that of *M. apri* ranges from 51 μ - 54 μ long by 33 μ - 38 μ in breadth. These measurements would seem to exclude the possibility of the eggs of larvæ, by virtue of their length and wriggling movements, passing through the œsophagus of these worms.

Because *D. viviparus, D. filaria* and *M. apri* possess nude mouth parts, simple, small, shallow-buccal capsules, and aural papillæ, only in case of the latter (Figs. 4 and 5) it would seem that they are unable to lacerate the host's tissue to provide themselves with blood; thus it would appear that the worms ingest the inflammatory exudate.

The normal coughing effort on the part of the host provoked by the inflammatory process, helps the animal to rid itself of the exudate in the bronchi. As a result, the lungworms are driven up towards the pharynx. These worms, in trying to evade displacement, wriggle down in the opposite direction, thus orientating themselves with their heads downwards and with their tails pointing towards the main tracheal branches. This arrangement is an advantage to the parasite, tending, as it does, to face the stream of the inflammatory exudate which is forced up the trachea during the expiratory movement associated with coughing. Thus, it would seem that the position adopted with the head downwards is a logical phenomenon and is a phase of their feeding complex.

XUM

Summary

1. Observations on the way *D. viviparus, D. filaria* and *M. apri* of swine orientate themselves in the respiratory tract, showed that they lie with their heads facing the terminal branches of the trachea and with their tails pointing towards the main trunks of the bronchial tree.

2. Most of these worms, except in heavy infestations, or where much displacement has taken place, are found in the bronchioles, rather than in the bronchi.

3. An explanation is offered on why these worms orientate themselves in this particular way.

4. Biochemical tests showed that the gut contents of *Dictyocaulus viviparus, D. filaria* and *M. apri* contain blood elements or resorption products.

5. Evidence is presented which indicates that the three above-mentioned worms feed by ingesting the inflammatory exudate and not by sucking blood.

Acknowledgments

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HYDROCYANIC ACID POISONING IN NUTRIAS CAUSED BY CASSAVA *(Manihot Utilissima Pohl)*

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A COLONY of fourteen nutrias (Coypus, *Myocastor Coypus*) at the Zoological Gardens, Dehiwela, Ceylon, was given some cassava (local name "manioc") tubers as substitutes for sweet potatoes. The tubers were from a plot where the plants had been growing undisturbed for over a year. They were pulled about forty-eight hours before being given to the rodents and probably had been bruised. Within four hours all the nutrias were violently ill, the symptoms noted by the attendants being frothy vomiting, rapid twitching of the muscles, staggering gait and collapse. Two animals died soon after the onset of symptoms and four others died within the next four hours. The remaining eight recovered and appeared more or less normal when inspected twenty-four hours later.

One of the carcases had been put in a refrigerator overnight and was autopsied the following day. The carcases of the five other dead animals had not been refrigerated and thus were rather decomposed, but the post-mortem appearances seemed to be similar in all cases.

The subcutaneous blood vessels were congested, the muscles pink and flabby, there was slight excess of peritoneal fluid; the large intestine was distended with dark semi-liquid ingesta and gas; the stomach contained about 3 oz. of pinkish-white pultaceous material; the lungs were pink, the trachea and bronchi contained frothy fluid; the heart contained partially coagulated blood; the blood vessels of the meninges of the brain were congested and the brain was moist. There was a distinct odour of prussic acid ("bitter almonds") from the viscera, especially noticeable after the organs had been in a stoppered jar for half an hour or so. A qualitative test disclosed that the liver, lungs, heart, kidneys and stomach contents contained appreciable amounts of prussic acid.

Discussion

Cassava or manioc poisoning in man is well known in countries where this tuber is used as a food, e.g., in many parts of Africa, South America, West Indies, India and Ceylon. However, it is not mentioned in the standard textbook of "Veterinary Toxicology" as occurring in animals; the reason may be that cassava is seldom fed to animals. One Ceylonese agriculturist states that he has fed the tubers to cattle without causing any harm; on the other hand, a Ceylonese veterinarian states that in the north of Ceylon, surplus manioc fed to cattle and goats has been known to cause poisoning. Charavanapavan (1944) quotes a report in the *Philippine Agriculturist* which stated that

XUM

manioc tubers three days old were poisonous to pigs, whereas fresh tubers had no effect. This author investigated the cyanogenetic glucoside of manioc and of lima beans (*Phaseolus lunatus*) and the accompanying enzyme (named "linamarin" and "linase," respectively). When the enzyme is brought into contact with the cyanogenetic glucoside as the result of injury or decay, prussic acid is liberated.

If the tubers are cooked, free prussic acid is driven off and the enzyme is destroyed by temperatures above 72° C., but the glucoside is heat-stable and can give rise to poisoning even after cooking. It is very difficult to get rid of the fixed prussic acid, and Charavanapavan found that the best way of preparing the tubers for human use is to dry peeled and sliced or rasped manioc at room temperature for twenty-four hours and then dry at 60° C. The drying at room temperature allows the enzyme to liberate much of the prussic acid, then the heating to 60° C. hastens the reaction. Manioc leaves also contain large amounts of prussic acid and must be carefully treated before they are safe.

The content of free and fixed prussic acid in different varieties of manioc and in different parts of the plant was investigated by Joachim and Panditesekere (1944), and the numerous varieties grown in Ceylon were described by Chandaratna and Nanayakkara (1944). These publications should be consulted for detailed information.

Acknowledgments

I am obliged to Mr. S. C. Alagartnam, G.B.V.C., who diagnosed the cause of death as prussic acid poisoning from manioc, and to Mr. U. S. B. Marandawala for making chemical examination of the organs and stomach contents.

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ABSTRACT

SERUM ALBUMIN IN THE TREATMENT OF SHOCK IN DOGS, by T. H. Brasmer, C. A. Taylor and H. C. Stephenson. Report of the New York State Veterinary College for 1948-49.

SERUM ALBUMIN (fraction V) obtained by ethanol extraction from bovine serum, as a 25 per cent solution in normal saline, has been used in the treatment of shock in the dog. The preparation is convenient in that it may be stored at room temperature for a long period; 100 ml. of 25 per cent bovine serum albumin is said to be equivalent to 500 ml. of blood plasma, and dosage is assessed on this basis.

Ten cases, mostly resulting from road accidents, were treated for shock with the preparation, which was given fairly rapidly intravenously or, in two cases, into the heart itself. Since serum albumin is ineffective in the absence of fluid reserves, intravenous or intraperitoneal saline or glucose saline was given where necessary. In addition, usual supportive treatment of narcotics or stimulants was applied as required. Five of these cases recovered, the remainder dying within twenty-four hours of injuries or pathological conditions too severe to benefit from shock therapy. No attempt was made to use any cases as controls.

From their experience the authors feel that there is no unfavourable reaction to bovine serum albumin when used in the dog, and that this preparation is an effective aid in the treatment of shock.

L.W.H.

REVIEWS

THE FEEDING OF FARM ANIMALS IN INDIA, by P. E. Lander, M.A., D.Sc., F.R.I.C., I.A.S., late Agricultural Chemist to Government, Punjab, and late Principal, Punjab Agricultural College, Lyallpur (1949). Macmillan & Co., Ltd. Price 25s.

A CONCISE and easily-read work such as this new book should fill a useful place in the literature upon the subject and be well received by stock-raisers and veterinarians in India, Pakistan and in this country.

The opening chapter deals with the soil, and is followed by a description of the constituents of feeding stuffs; then digestion, absorption and utilisation of food is considered. The general principles of maintenance and production come next, followed by feeding standards and balanced rations.

Consideration of feeding stuffs met with in India includes the average chemical analyses of Indian foodstuffs. Preparation and storage of animal foodstuffs and the subject of harmful food and famine fodders is dealt with, and followed by chapters upon the feeding of cattle and buffaloes, sheep and goats, horses and mules, camels, pigs and poultry. The concluding chapter deals with the economics of feeding. Five appendices giving analytical data of foodstuffs and their chemical composition and digestible nutrients are included.

XUM

The data is presented in an interesting, readable manner without burdening the reader with too much detail upon structure and chemical formulæ.

Obviously, in a relatively small book embracing so wide a subject, it is impossible to deal adequately with every aspect, but the rather small space devoted to the micronutrients, such as cobalt, copper and iodine, and their importance to the plant and animal, seems hardly adequate.

Undernourishment in India and Pakistan must be one of the main causes of loss and ill-health in farm stock, and this book should be of value in giving a clear account of the essentials necessary in the diet of farm animals, and do much to improve the standards of feeding.

DIAGNOSTIC METHODS IN VETERINARY MEDICINE, by G. F. Boddie. Third Edition. Edinburgh: Oliver & Boyd, Ltd. Price 20s.

SOME men are extremely good diagnosticians yet they are unable to impart to others a reasoned account of how they arrive at a diagnosis. The reason for their accuracy and also for any basic explanation thereof is that their skill depends upon recognition of a picture, a facsimile of which they have seen on a previous occasion. Other men arrive at their conclusions by assessing the significance of any deviations from the normal and by referring these deviations back to some tissue or organ which may be temporarily or even permanently abnormal in structure and/or function.

This latter method is the scientific approach. Its success depends upon a reasonably sound knowledge of animal anatomy and physiology. It has been said that surgery is anatomy plus technique and that medicine is the physiology of the abnormal with a little pathology thrown in by way of explanation. Professor Boddie sets out to instruct the reader how to recognise deviations from the normal and to give an explanation. Such an approach is fundamentally sound and the fact that a third edition is accessory within six years would indicate that his efforts have met with a wide approval.

It is good to note that Boddie pays great attention to the ordinary clinical senses, i.e., what one can see and feel. He gives details also of the various modern aids to diagnosis. These aids are accessory to a sound methodical clinical examination. If such aids as X-rays, pathological and clinical reports, etc., were the be-all and end-all of diagnosis then there would be little need for a trained physician. It would be possible to hand these things into an office or bureau, some clerk would examine them, and in due course a diagnosis would be returned inscribed on a suitably numbered form.

This edition, like its precursors, follows a systematic plan. Regional anatomy, general signs and symptoms, methods of examination, general and specific, and an interpretation of the abnormal features which may be discovered. Attention is drawn to certain special factors which arise owing to the multiplicity of species with which a veterinary surgeon is called upon to deal. Nine chapters are written on this theme, the first two chapters being devoted to the general preliminary methods of investigation.

XUM

Chapters XIII to XVIII concern the various aids to diagnosis, i.e., the allergic reactions, clinical bacteriology and hæmatology, and readers who attempt this type of work in their practices will find them both useful and instructive. The coloured plates inserted between pages 298 and 299 are of the highest order. Chapter XIX deals with post-mortem technique. It is concise and good.

Poultry diseases, a branch of veterinary diagnostic work which becomes of increasing importance, is dealt with very ably in Chapter XX. There are three appendices, dealing in turn with case recording, notifiable diseases, and incubation periods. If more people were to follow the instructions on case recording our professional journals could be so transfused that they would regain the vigour which was theirs in the nineteenth century.

A competent, experienced clinician will find much interest in this book. He will learn he may sometimes criticise. Young clinicians, especially those who are still undergraduates, will find this book to be a great help in their efforts to develop their clinical skill.

NEWS

VISIT TO MESSRS. CHAPPIE, LTD., FACTORY

On May 11 last, many veterinary surgeons and Press men were invited by Messrs. Chappie, Ltd., to visit their factory at Slough. Everyone present was impressed by the conditions under which the dog and cat foods were prepared. No greater care could have been exercised had the food been intended for human consumption. The raw materials are very carefully selected and blended, with laboratory control at each stage, and the utmost cleanliness is observed throughout, even to the extent of a final laboratory test on each batch of food, for bacteriological content.

CONGRESS IN DENMARK

The International Standing Committee, appointed at the Milan Congress in 1948, having examined the possibilities for holding the next Congress, it has been agreed that the Second International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination will be held in Copenhagen, Denmark, from July 7 to 10, 1952, with the following programme:—

(1) The physiology of reproduction.
(2) The pathology of reproduction.
(3) Artificial Insemination (A.I.) of domestic animals.

The Standing Committee has nominated Dr. John Hammond, School of Agriculture, Cambridge, as president, Professor Nils Lagerlφf, Stockholm, as

XUM

vice-president, and Professor Ed. Sørensen, Copenhagen, as secretary-general.

The Congress is sponsored by the Danish Ministry of Agriculture, and will be organised by the Royal Veterinary and Agricultural College, Copenhagen, the Danish Federation of Cattle Breeding Societies for A.I., and the Society of Danish Veterinary Surgeons.

A more detailed, tentative programme will be issued as soon as possible. All particulars are obtainable from the secretary-general, Prof. Ed. Sørensen, the Royal Veterinary and Agricultural College, Bülowsvej 13, Copenhagen, V. Denmark.

NOTICE

BUFFERED CRYSTALLINE PENICILLIN G, POTASSIUM SALT, DC(B)L.

It has been shown that the naturally occurring "non-penicillins" in amorphous ("coloured") penicillin act as buffering agents and delay the breakdown of the material in solution. These "non-penicillins" are removed in the manufacture of crystalline penicillin G, and although this leads to improvements in potency, colour, and storage properties (in the dry state), crystalline penicillin G, because of this lack of natural buffering agents, is extremely unstable in solution. The addition of a suitable buffering agent to the crystalline material overcomes this disadvantage. Laboratory investigation* shows that the incorporation of 4.5 per cent anhydrous sodium citrate permits the preparation of aqueous solutions of crystalline penicillin G which retain their potency for considerable periods. The Distillers Company (Biochemicals), Ltd., announce the availability, from their distributors, of buffered crystalline penicillin G potassium salt, DC(B)L, in containers of 0.2, 0.5, 1.0, 5 and 10 m.u., selling at the same prices as the non-buffered material.

* Clapham, *Pharm. J.*, 1950, 165, 126.

Publishers' Notices

THE BRITISH VETERINARY JOURNAL, with which is incorporated THE VETERINARY JOURNAL, is published monthly, and copy for advertisements should be in the hands of the advertisement manager not later than the 20th of the preceeding month, if proof is required. Tel.: Temple Bar 3386.

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

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XUM